The Engineering and Mining Journal

VOLUME 96 AUGUST 16, 1913 NUMBER 7

New Smeltery of United Verde Copper Company

By Richard H. Vail

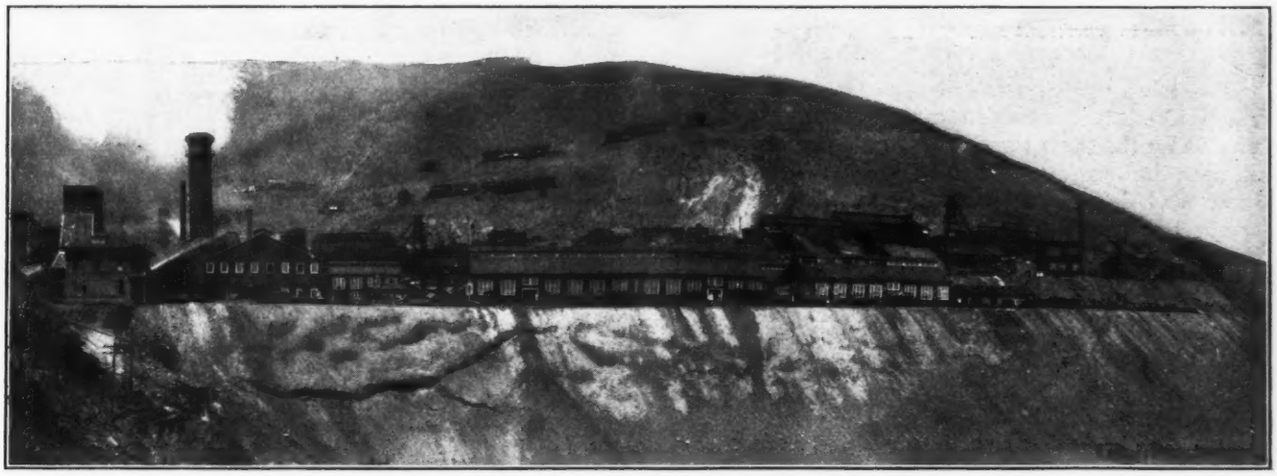
SYNOPSIS—The United Verde Copper Co. is constructing a new smeltery at Clarkdale, Ariz., about five miles below Jerome in the Verde Valley. It will have an initial capacity of 2500 tons per day, or double that of the present works, which is situated over the mine and is incapable of enlargement, owing to topographic limitations and surface subsidence. To supply the new works, the output of the mine will be practically doubled; more custom ore will also be smelted after the completion of the Clarkdale plant.

The new smelting plant of the United Verde Copper Co. will be situated at Clarkdale, Ariz., a new town on the west side of the Verde River, about five miles in an air line from the present works and mine at Jerome. A mine that has produced for nearly 25 years as Senator Clark's United Verde has done is deservedly remarkable; and it is noteworthy that after such a production the mine still warrants the building of a new plant of double the capacity of the old one. The increased scale of operations will permit the handling of low-grade ore that it was impracticable to smelt in the old works; the new Clarkdale plant will thus not only effect an economy in the treatment of the low-grade material, but will also smelt the high-grade ore at greater profit.

The new works will have an initial capacity of 2500 tons per day as against 1000 to 1200 tons in the present plant. The new works was designed by Repath & McGregor, of Douglas, Ariz., who have drawn plans for most of the large smelting plants erected in this country during the last few years. The first steel for the new works was raised on May 26, 1913, and it is expected that it will be ready to blow in about July 1, 1914. Briefly, the smelting equipment will comprise six Wedge roasting furnaces, three reverberatory furnaces, 19x100 ft., four 48x320-in. blast furnaces, and four upright converters.

With this increased equipment, it will be the policy of the company to handle more custom ore and to take ores from developing properties in the district, which was impracticable in the past owing to the limited capacity of the works.

The Clarkdale smeltery site is on a bench in the Verde Valley at an elevation of about 3460 ft. and sufficiently high above the Verde River to provide ample dump room for slag on the flat above the river. A standard-gage railroad has been built up the Verde Valley to connect with the Santa Fé, Phœnix & Prescott Ry. at Cedar Glade, 39 miles. This standard-gage road will in itself effect a great saving in smelting operations, as it will eliminate the transfer expense heretofore necessary on all coke, machinery and supplies. The rough country traversed by the old United Verde & Pacific railroad did not permit of converting it to standard gage, as both the grades and curves are excessive, the maximum curves being 45° and the grades 4%; this narrow-gage road connecting with Jerome Junction will probably in time



United Verde Smelting Plant, Jerome, Ariz.

be abandoned. The Clark interests have organized the Verde Tunnel & Smelter R.R. Co. to build a standard-gage road from the new smeltery site to the mouth of the Hopewell tunnel, an adit at the 1000-ft. level of the mine. As this adit will become the main artery of the mine, ore bins will be constructed there and the new railroad, approximately 10 miles in length, with all its connections, will deliver the ore to the smeltery receiving bins. This new road will have 75-lb. rails and a maximum grade of 4% compensated for curves, the sharpest of which will be 25°. The ore will be hauled in 50-ton bottom-dump cars by oil-burning Climax geared locomotives.

Ground was broken at the new site in September, 1912, and the general grading, involving about 75,000 cu.yd., was completed in April, 1913. The foundations for the entire plant will be of concrete, about 15,000 cu.yd. being required. For the concrete El Toro brand cement is used, the general mixture for foundations being 1:3:5, and 1:2:4 where reinforced concrete is used. All smeltery buildings and trestles will be of steel and where inclosed will be sheathed with corrugated iron, except in the case of the dust chambers and the power house. About 9000 tons of structural steel will be required for the buildings and trestles, and this is to be delivered at the rate of about 1000 tons per month.

Some of the work on the new smelting plant is being done on contract; the grading having been done by T. C. Snider, of Prescott; the structural-steel work by the Kansas City Structural Steel Co., Kansas City, Mo.; the brick plant was built and is at present operated under contract by the Barker Construction Co., of Denver, Colorado.

An Admirable Construction Camp

The company has established an unusually complete and attractive construction camp, where its men have practically the same comforts and accommodations as at an operating property. The company's policy in this respect has been admirably carried out by the constructing engineer, F. J. Brulé, who has inaugurated a daily garbage collection, tight garbage cans, and regular disinfecting of all outbuildings. Sewers are being laid and a concrete septic tank will be built to serve the smeltery and the construction town. A concrete latrine will also be built for use of the smeltery employees. The more or less permanent character of the construction camp, which will later become the "Mexican town," has purmitted more expensive construction than is usually possible. All frame cottages of two, three and four rooms have been equipped with screened sleeping porches, and the bunkhouses represent a decided departure from usual practice. There is in reality no bunkhouse in the ordinary sense of the word, these buildings being divided into rooms occupied by two men; each room here also has a screened sleeping porch. An emergency hospital has been built, a trained nurse provided for the construction town, and the various foremen instructed in first-aid work. This is in striking contrast to the usual construction camp, which seldom provides such accommodations either for physical comfort or health.

The site is particularly fortunate in its natural facilities for construction. A gravel-washing plant, having a capacity of 8 cu.yd. per hr., has been built near the bed of the Verde River and supplies three sizes of gravel for the concrete work and a washed sand for use in mortar, plastering, and for brick making. A convenient bank of clay led to the establishment of a brick-making plant with a capacity of 20,000 brick in nine hours. An eight-mold Brewer brick machine is used, and it is contemplated that the permanent town of Clarkdale will be built of brick upon the mesa a short distance to the south of the present construction town.

Standard-Gage Tracks Throughout Plant

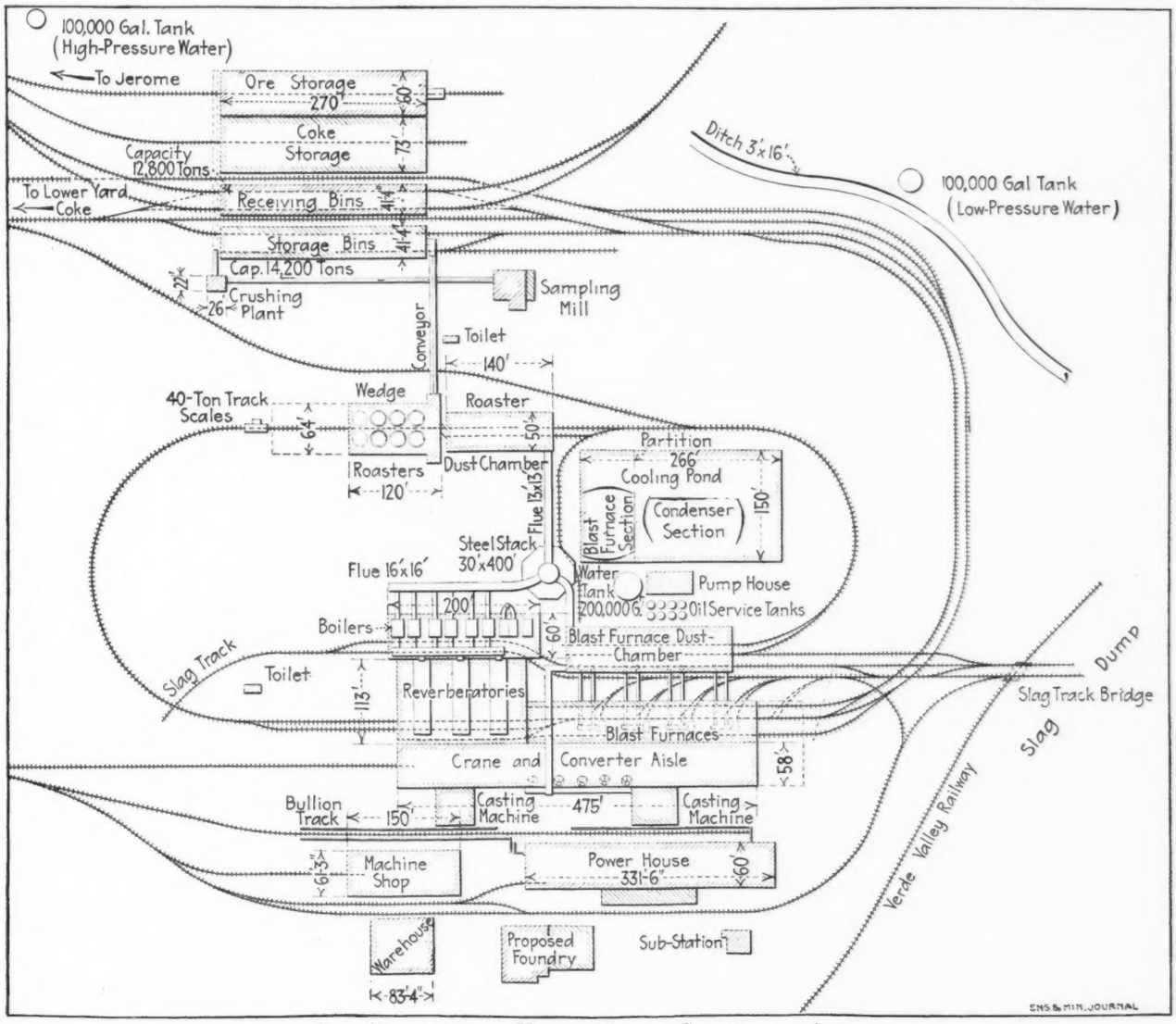
All ores entering the works will be weighed on a 150-ton Buffalo track scale situated above the works; the copper bullion or other products leaving the plant will be weighed on another similar scale in the Verde Valley L.R. yards. The industrial-railway system of the smelting plant will be of standard gage throughout, 60-lb. rails being used, and a feature of the design is the elaborate intercommunication of tracks, it being intended to expedite transport and reduce to a minimum any stoppage of operation from blocked tracks. Tramming will be done by means of 10-ton electric locomotives.

The Verde Tunnel & Smelter railroad will deliver the ore either to steel receiving bins or to the storage yard. The receiving bins have a capacity of 12,800 tons and are 41x270 ft.; east of the receiving bins are steel storage bins that cover the same area, but have a larger capacity, 14,200 tons, owing to different hopper arrangement. West of the storage and receiving bins there are steel trestles over the storage yard with an area of 73x270 ft. for coke storage and of 60x270 ft. for ore, thus providing a large amount of storage in case of emergency. As shown in an accompanying illustration, the ore in the bins may be drawn either into weighing hoppers and thence to furnace-charge cars, or may be delivered on 30-in. belt conveyors that travel underneath and parallel with the bins; this ore is then dropped on a conveyor traveling at right angles to the bins and delivering into the crushing plant. After crushing in a 30x18-in. Blake crusher the ore is taken to the sampling mill by a conveyor having a capacity of 100 tons per hour at a speed of 300 ft. per minute.

The crushing and sampling mill is 42x40 ft. and consists of a crushing section and a sampling section. The crushing section will contain two 4x14-ft. trommels, one with double screen having 1-in. and ½-in. perforations respectively, the other trommel having a screen with ½-in. perforations and an outer jacket that is blank; a 20x10-in. Allis-Chalmers Blake crusher; a set of 54x24-in. Allis-Chalmers rolls crushing to ⅜ in. This set of rolls may be cut out if it is desired to send the oversize from the last screen directly to the coarse bins. The sampling section will contain four Snyder samplers of the following sizes and percentages of cut: One 60-in., 10%; one 42-in., 20%; one 27-in., 20%; and one 27-in., 10%. The sample is recrushed between the sampling stages by the following machines: Between the first and second samplers by one 20x10-in. Blake crusher; between the second and third samplers by one set of 36x12-in. rolls; between the third and fourth samplers by a set of 24x1-i2n. rolls. The final sample is collected in a sample safe. The quartering and bucking rooms are contained on the first floor, partly in the main portion of the sample mill and in an annex. Suitably arranged belt conveyors deliver the fine and coarse products of the sampling mill to the storage bins.

Six Wedge Roasters

In the roaster building, which is 64x120 ft., there will be installed initially six Wedge mechanical roasting furnaces; they are air cooled and are 21 ft. 6 in. in diameter. Two 25,000-cu.ft. fan blowers, direct connected to motors, will supply cooling air at 2-oz. pressure. Provision is made for two additional furnaces in the present building, when required, and there is ample room for extension of the building as is the case throughout the entire plant should the future require any further increase of smelting capacity. The fine ores from the storage bins are brought to the roaster building by belt conveyors, of which 18 are used in the handling of the ores to and from the bins, crushing plant, sampling mill, and roaster building.



The New United Verde Works, Clarkdale, Ariz.

The roaster gases pass into a dust chamber, 50x140 ft. long. It has a double-hopper bottom with 45° slope, and is 21 ft. high above the hoppers, the vertical depth of the latter being 14 ft. The building is of steel and brick with 24-gage copper roofing. There will be baffle curtains in the end panels, and in the center panel, chains and wires will be used; the end-panel baffle curtains will consist of 6-in. 10-lb. bars, one inch apart. The individual bars are fastened at the top to two angles that rest on 6-in. channels, and they extend practically to the bottom of the chamber and about midway into the hoppers. A flue, 13x13 ft., connects the dust chamber with the main stack.

The calcines are transported to the reverberatories by 10-ton electric locomotives in specially designed calcine cars having double-hopper bottoms. The cars are 6 ft. 3 in. in height from the bottom of the hoppers to the top of the car and are 7 ft. 8 in. wide by 16 ft. long, and have two sets of trucks. On leaving the roaster building the calcines are weighed on a 40-ton Buffalo track scale.

The Reverberatories

The main furnace building will be 475 ft. long, of which 143 ft. will be devoted to the reverberatory furnaces. There will be three of these, 19x100 ft., built of Standard silica brick and fired with oil. The reverberatory gases will pass into a main-header flue in a boiler house, 60x200 ft., where branch flues lead to six Stirling water-tube boilers of 713 hp. each. There will be two waste-heat boilers for each furnace and it is

expected to realize 70% of their rated capacity, or from 30 to 35% of the thermal efficiency of the oil used in the reverberatories. The boilers will be equipped with superheaters to give the steam 100° of superheat. There will also be in the boiler house, three reserve oil-fired Parker water-tube boilers. The reverberatory gases finally pass to the main stack by a 16x16 ft. flue, 207 ft. long.

The oil for the reverberatory furnaces and for the separately fired boilers will be drawn from eight 111-bbl. steel tanks near the pump house, in which are situated the boiler-feed pumps, three Aldrich triplex pumps being used. Additional oil storage is provided by one 10,000-bbl. tank near the trestle of the receiving bins at the northwest corner of the plant. This tank is so situated that oil may be unloaded by gravity, and it may also be taken out by gravity for railroad engines and other uses about the plant.

Blast-Furnace Equipment

The blast-furnace equipment will include four furnaces, each 48x320 in., situated to the north of the reverberatory building. The furnaces will have single-tier jackets with tuyeres spaced 13¼ in. apart. The matte and slag will be tapped from the end of the furnace. Above the charge floor, the furnaces will be supported on a structural frame and will have a steel air jacket for preheating the blast. The gases will be taken away from each furnace by two 6½-ft. uptakes. The furnaces will have an oval settler, 26 ft. long by 12 ft. 9 in. wide, set transversely with the main axis of the furnace; the settlers will be lined with chrome brick.

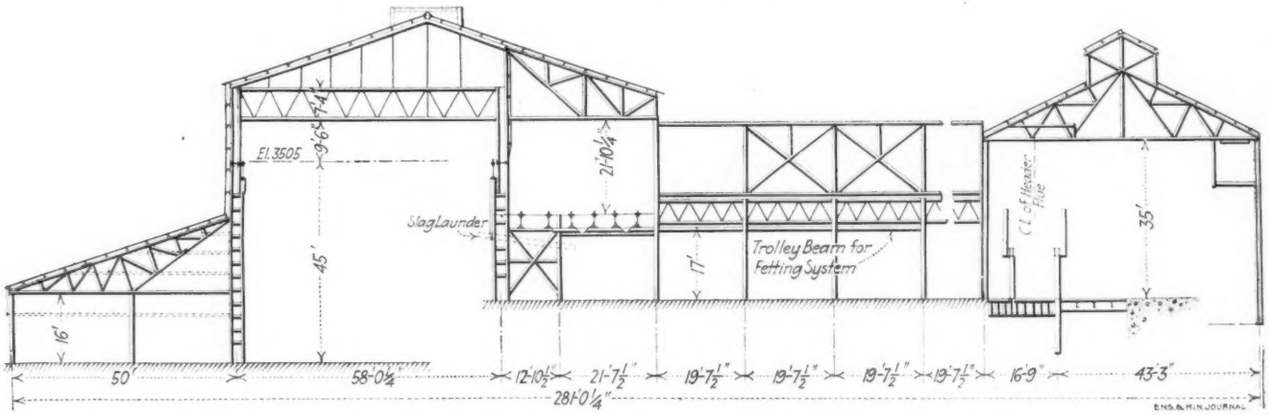
The blast-furnace charges will be brought to the feed floor in Anaconda-type charge cars, 7 ft. wide by 5 ft. 6 in. long by 2 ft. 6½ in. deep. In dumping, the doors on the furnace side of the cars release as the car body is raised by a compressed-air hoist. Coke will be brought to the blast-furnace building in railroad cars that will be set on a track parallel with the furnaces, but behind the charge track; the coke will be unloaded from the railroad cars directly into the charging barrows.

The slag from the blast furnaces and reverberatories will be taken away in electrically tilted slag pots of 225 cu.ft. capacity drawn by 18-ton electric locomotives. The slag tracks will cross the Verde Valley R.R. Co.'s tracks at an elevation of 26 ft. on a reinforced-concrete viaduct. The deck of the latter will be protected by side walls, so that there will be no spilling of molten slag on the railroad right-of-way.

Upright Converters

There will be four 12-ft. upright converters installed at present and these will be lined with magnesite brick. The converters will be of Allis-Chalmers make, tilted by 50-hp. motors. They will be served by two 40-ton Morgan electric cranes operating in a converter aisle, 475 ft. long by 58 ft. wide. The converter slag will be poured into the reverberatory furnaces, or may be poured into the blast-furnace settlers if it should be found desirable. Slag skulls will be dumped into a pocket, and means will be provided for breaking them to a size suitable for blast-furnace charge.

The copper will be poured from the converters into ladles, which will be transferred by overhead crane to the casting-machine tilting stands. Straight-line casting machines of special design will be used. Directly behind the converters is the bullion yard, served by a depressed loading track on which the car floors will be at the level of the bullion yard.



Section through Converter, Reverberatory and Boiler Buildings

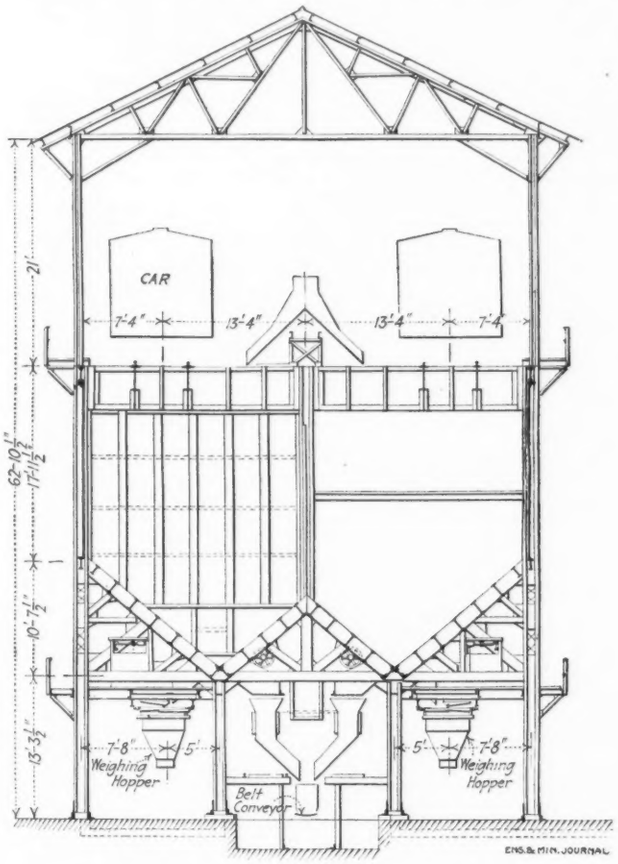
The converter gases will be carried by a balloon flue delivering into the blast-furnace dust chamber, which is 60x220 ft. long and of similar construction to the roaster dust chamber. It is of greater height, being 29 ft. above the hopper line, and the hoppers have a vertical depth of 19 ft. The baffles are arranged in a manner similar to those in the roaster dust chamber, except that a longitudinal set of baffles extends nearly parallel on one side, thus making a duct for leading the gases from the blast furnaces to one end of the dust chamber.

A 12x14-ft. steel flue, 72 ft. long, leads to the main smeltery stack. The latter will be of steel, 30x400 ft. high—an unusual height for a steel stack, reported by the engineers to be the highest in the world. The stack will be lined with a 4½-in. course of selected red brick. It will rest on a reinforced-concrete base, 70 ft. in diameter by 10 ft. deep, containing 1320 cu.yd. of concrete and 20 tons of second-hand rails. The steel for the stack will be furnished by the Chicago Bridge & Iron Co., which will erect the stack, also a 200,000-gal. water tank and the eight oil-service tanks.

The water supply will be derived from two sources: (1) From Haskell Springs for the high-pressure system; (2) from the Verde River for the boiler-water and low-pressure system. Haskell Springs are about 3½ miles

from Clarkdale at an elevation of 3868 ft.; the elevation of the 100,000-gal. high-pressure tank at the smeltery is 3643 ft. Haskell Springs supply about 350 gal. per min. and the water will be conveyed through an 8-in. American Ingot Iron pipe for a distance of 9051 ft. to a 500,000-gal. concrete reservoir at an elevation of 3755 ft. From the reservoir an 8-in. pipe will convey the water through the proposed town of Clarkdale, where branches for fire and domestic service will be taken off, a 6-in. line continuing to the high-pressure redwood tank at the smeltery. From this tank an 8-in. American spiral-riveted pipe, with suitable branches, will serve the various buildings and the fire-protection system.

The low-pressure system will be supplied from a pump house at the Verde River, where are two Aldrich triplex

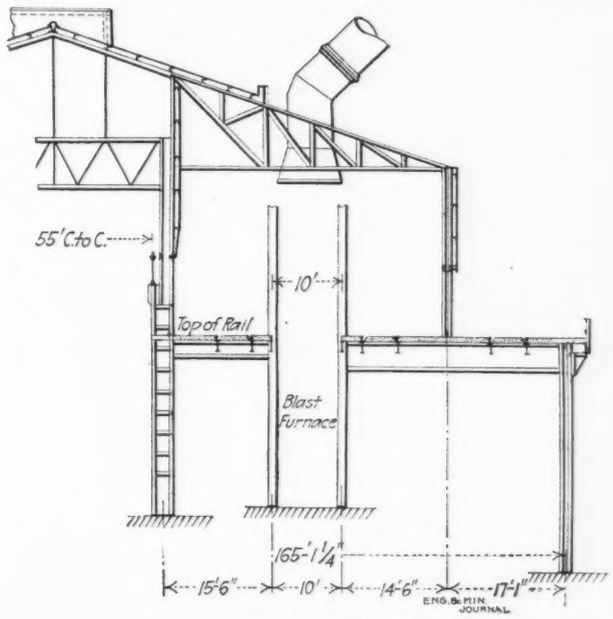


RECEIVING BINS

pumps, having a capacity of 600 gal. per min. each. The suction end of these pumps leads to a concrete well sunk in the bed of the river. A 12-in. American spiral-riveted pipe takes the discharge from the river pumping station 1500 ft. into the smeltery yard, where an 8-in. branch is taken off and interconnected with the high-pressure system; from the same point a 10-in. line continues to the low-pressure tank at the northwest corner of the smeltery site. This is also a redwood tank of 100,000-gal. capacity. From both the high-pressure and low-pressure mains, branches are taken to a 200,000-gal. steel tank. This tank furnishes storage for blast-furnace needs.

A cooling pond, 150x266 ft., with a capacity of 1,100,000 gal., will receive the hot condenser water and the jacket water from the blast furnaces. The pond is built of reinforced concrete, lined with asphalt to prevent leakage. The furnace water will be received in the south 73 ft. of the pond, a partition wall separating this portion from that receiving the condenser water. The blast-furnace section will have eight sets of five nozzles each, and the condenser section will have 44 sets or 220 spray nozzles. In the adjacent pump house, besides the boiler-feed pumps, are two centrifugal pumps for pumping the jacket water to the spray nozzles, and two pumps for returning the cooled water to the 200,000-gal. tank that supplies the blast furnaces by gravity.

The power house, machine shop and warehouse will be along the east side of the plant, and work has been carried forward on these three buildings first so as to take advantage of the facilities for construction purposes. Electric power is now supplied from a substation, taking current from the Arizona Power Co.'s 40,000-volt line, and transformed down to 2300 volts in the substation, where a temporary compressor is installed to supply air for riveting the steel work. The electric current is again stepped down to 440 volts for outside motors at the brick



BLAST-FURNACE BUILDING

works, the gravel-washing plant, etc. Having power at so early a stage in the construction work is of much advantage. A Brownhoist locomotive crane is expediting greatly the setting and handling of the structural steel. Four motor trucks are used, three Mack trucks of 2-, 3- and 5-ton capacity and one 3-ton Gramm.

THE POWER HOUSE

The power house will be a steel-frame building, 331x60 ft., with sides of brick and Detroit Fenestra sash, giving approximately 75% of window area in this building; it will have a high concrete basement, similarly equipped with a liberal amount of ventilating sash. In the power house much of the blowing machinery now in use at the old works will be utilized; all the details of the equipment in this building have not been decided, but the principal items will be:

One 400-cu.ft. Roots blower driven by a 16x32x36-in. Allis-Chalmers tandem-compound engine.

One 400-cu.ft. Roots blower driven by a 400-hp. motor.

One 300-cu.ft. Roots blower driven through rope transmission by a three-cylinder Diesel double-unit oil engine.

One 300-cu.ft. Roots blower driven at both ends by two 200-hp. motors.

One 224-cu.ft. Roots blower, driven at one end by a 200-hp. motor.

One Nordberg converter blowing engine, with 32- and 64-in. steam cylinders, 60- and 60-in. air cylinders and 54-in. stroke; this engine delivers 351 cu.ft. of air per revolution and operates at about 60 r.p.m., supplying air at 16-lb. pressure.

One Southwark converter blowing engine, with 28- and 52-in. steam cylinders, 60- and 60-in. air cylinders and 60-in. stroke, delivering 351 cu.ft. of air at 16-lb. pressure and operating at about 60 revolutions per minute.

One E. P. Allis converter blowing engine, with 20- and 36-in. steam cylinders, 44- and 44-in. air cylinders and 42-in. stroke, operated at from 60 to 70 r.p.m. and delivering 132 cu.ft. of air at 16-lb pressure.

One Rateau-Smoot turboblower, built by the Southwark Foundry & Machine Co., and having a capacity of 2500 r.p.m. of 25,000 cu.ft. of air per minute at 16-lb. pressure.

One Nordberg air compressor with 22- and 24-in steam cylinders, 19- and 32-in. air cylinders and 48-in. stroke; capacity, 1800 cu.ft. of free air per minute at 100-lb. pressure.

One 1500-kv.a. Allis-Chalmers Parsons turbogenerator, to operate at 3600 r.p.m. delivering 60-cycle, three-phrase, 2300-volt current.

One 500-kv.a. Westinghouse Parsons turbogenerator, to operate at 3600 r.p.m. delivering 60-cycle, three-phase, 440-volt current.

Two 200-kw. motor-generator sets supplying direct current for the cranes, electric locomotives and casting-machine motors.

Two Weiss condensers, each having a combined capacity of approximately 75,000 lb. of steam per hour; connected to two Southwark dry vacuum pumps, one of which is 12-30x24-in. and the other 14½-36x30 in.

One Allis-Chalmers condenser, having a capacity of 40,000 lb. of steam per hour, and connected to one 12-30x24-in. Union dry vacuum pump.

Six centrifugal pumps to handle condensing and circulating water and miscellaneous switchboard apparatus will be situated in an alcove on the east side of the power house.

The Old Smelting Works

The present smelting plant is situated directly over the mine, and the removal of smelting operations to a new site has been made imperative both by the topographic limitation to increasing the size of the plant and by the serious caving of the mine under the present surface plant. While smelting operations have not at any time been completely interrupted as a result of caving, it has been avoided at times only by extraordinary activity. Some idea of the difficulties that have been overcome will be appreciated when it is stated that practically the entire main power-house site has caved and on account of the limited ground space on the abrupt mountain side, the company has been compelled to dispose its power machinery in four different power houses.

The present works is the outgrowth of the initial operations with a Fraser & Chalmers cylindrical water jacket of 50-tons capacity; the works have in effect been rebuilt several times. Subsidence of the surface has been taking place for a number of years. The foundation of the cylinder end of the largest blowing engine at one time sank until it was five feet lower than the other end and nine feet below the original foundation; closing the smelting plant was at first thought to be unavoidable, but this engine was operated in this position until new blowing capacity was provided. In 1904 the tilting reverberatory furnace used for smelting flue dust had to be abandoned. As new works were under consideration at that time, the reverberatory was not rebuilt and the flue dust, which amounts to about 4% of the furnace charge, has since been returned to the blast furnaces after wetting. Other temporary expedients had to be adopted both in mining and smelting, as it was impracticable to install new equipment pending the erection of the new works.

While the smelting practice is somewhat backward, the delay in the construction of new works, due to the indecision of railroad companies in regard to building extensions, has contributed to this condition, as well as having increased greatly the trouble of the operating officials. The costs, nevertheless, have been kept lower than might have been expected under the circumstances, as will be noted from the following figures for the 1912 operations: Smelting and converting, $3.25 per ton of ore; $72.67 per ton of copper.

(To Be Concluded)

Beaver Consolidated

The annual report of the Beaver Consolidated Mines, Ltd., covers the year ended Feb. 28, 1913. During the year there were shipped 689,921 oz. of silver. Actual ore sales brought in $333,052; corrections for ore in transit at the beginning and end of the year bring the production to $415,424; interests, rent, profits on boarding house, etc., give total receipts of $419,671. Operation expenses were $211,252; administration expenses, $20,086; leaving earnings of $188,333. Depreciation on plants and equipment, development, furniture, etc., was written off to the extent of $13,809, and $180,000 was paid in dividends during the year.

Development includes 3414 ft. of drifting, 745 ft. of crosscutting, 185 ft. of sinking and 157 ft. of raising. Stoping was done to the extent of 4316 sq.yd., and stations were cut on the 600- and 700-ft. levels. These two new levels show excellent indications of ore. It is found that the 530-ft. level in the diabase is giving excellent results. It is impossible to estimate the unbroken ore underground, but the broken ore amounts to 12,500 tons, containing approximately 30 oz. per ton, and there is on the dumps 20,000 tons, containing approximately 20 oz. per ton. The estimated profits on these reserves after treatment and marketing expenses, is about $280,000. The capacity of the concentrating mill was increased to almost 100 tons per day during the year. There was milled 17,842 tons, producing 289 tons of concentrates containing 278,512 oz. of silver and giving a net profit after milling and marketing charges of $123,655. The mill heads averaged 21.48 oz. and the tailings 3.9 oz., giving an extraction of 81.8 per cent.

The Erie Cobalt property was purchased during the year, principally to acquire the water rights of Kirk Lake, part of the property lying under this lake. A three-quarter interest in the Donaldson claims in the Elk Lake district was also acquired, and a new company was organized, the Beaver Auxiliary Mines, of which the Beaver Consolidated owns 75%, with the right to purchase the additional 25% in preference to any other buyers. Excellent indications have been obtained by the development work performed on this property, but the occurrence is such as to prevent an estimate of the tonnage or value.

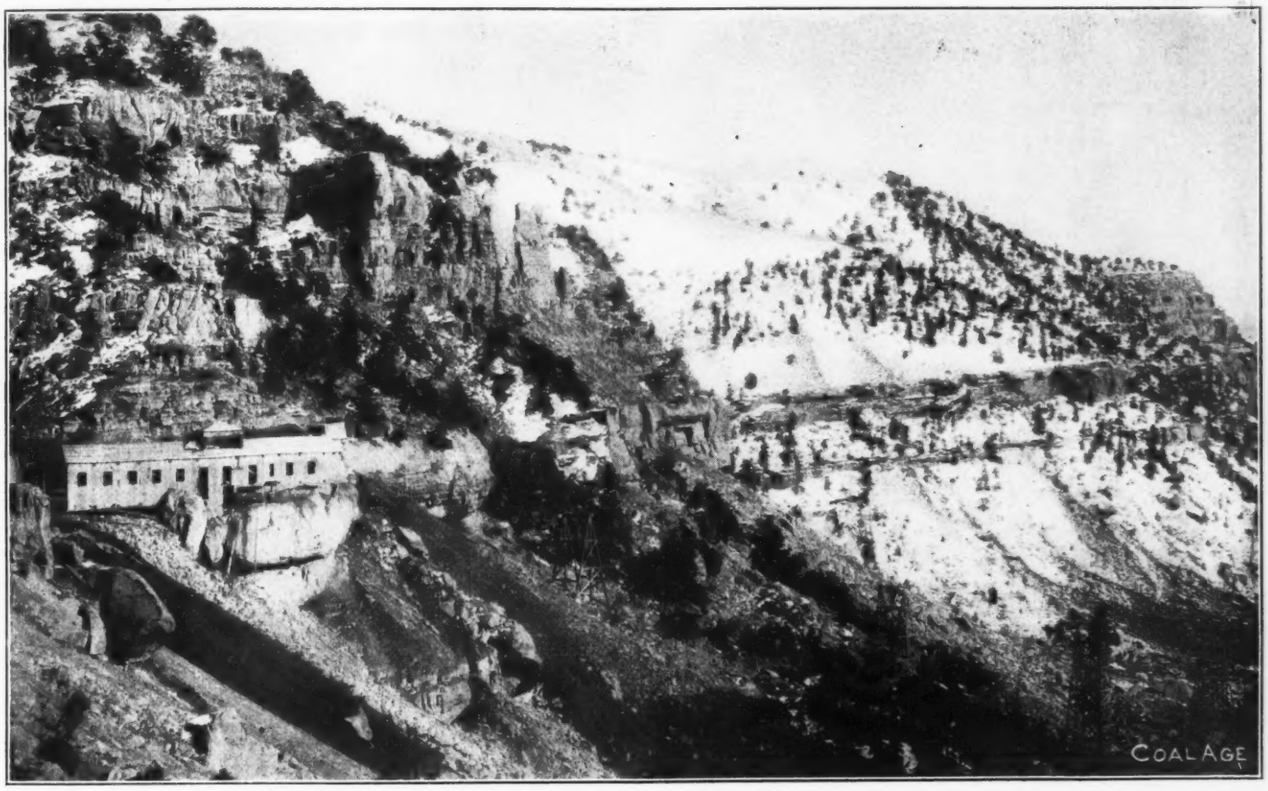
The system of an independent mine inspector having complete charge of all work at the Beaver mine, so far as its safety is concerned, has given excellent satisfaction, and, since the installation of the system, no serious accident has occurred underground.

Unusual Design of Overhead Tramway

SYNOPSIS—A 3000-ft. aërial tramway, designed for a heavy tonnage. The buckets are detachable and are mounted on trucks for use as mine cars. A cost of 1¾c. per ton is obtained. The tramway generates an appreciable amount of power.

An overhead aërial tramway, in use in Utah since early in the year, presents some highly interesting features of design. The tramway connects the mine outlet with the loading bins on the railway 3000 ft. away and 321 ft. lower. Owing to the abrupt topography of the cañon and the situation of the tramway, considerable ingenuity was necessary in the design of some of the supporting structures. At one point, where a sharp change of grade takes place, the vertical curve in the cable is divided between four saddles. One side of this structure rests on solid rock, while the other is cantilevered over the edge of the precipice. At the loading terminal, one end of the structure is carried on a 50-ft. arch truss. The line is of 10-ft. gage and the towers are so designed as to allow ample clearance when the buckets are swinging. This was necessary on account of the high winds that prevail in the winter. Lock-coil cable is used for the tracks, that for loaded buckets being 1⅝ in. in diameter, and that for empties, 1¼ in. These cables rest in grooved saddles supported by 10-in. steel channels on the towers. Each is anchored at one end, while at the other it is attached to chains, which, in turn, pass over heavy sheaves and are fastened to weight boxes. This method of back-balancing at all times maintains a uniform tension on the cables independent of the loading or weather conditions. The gross weight of box and stone on the loaded cable is 35 tons, and on the smaller cable, 16 tons. The weight boxes are so suspended, that when the loads are off the line, the box rests on the ground, and when the line is loaded, the box springs clear. This relieves the cable from the total strain when not in use, and increases its life.

Of the 321-ft. difference in elevation of the terminals, 225 ft. occurs in the first 1300 ft. from the loading terminal. This inclination is sufficient not only to run the tramway, but to develop considerable power. The tramway is motor-driven and required 12 hp. to start off with the empty buckets going up hill. After being limbered up, about 15 hp. was developed, with a loading equal to 75 tons per hr. At the ultimate capacity of 250 tons per hr., approximately 50 hp. will probably be developed.



THE HEAD OF THE CONVEYOR LINE, SHOWING ROUGH COUNTRY

This power is not wasted. The motor acts equally well as a generator and returns surplus current to the power line, at the same time acting as a brake to regulate the speed of travel. Other brakes are provided on both the main drive and pinion shafts for stopping the line and controlling its speed, should any accident occur to the motor or other connections.

The traction rope is a ⅞-in. Lang-lay cable and is maintained at proper working tension by a 5000-lb. back-balance. The rope speed is 500 ft. per min., this having

Note—Excerpts from an article by W. R. Elliott in "Coal Age," July 26, 1913.

been found most desirable for the loads handled. The tension sheave of the traction rope is 10 ft. in diameter and is located at the discharge terminal. This sheave runs upon a bearing mounted on a truck connected to the weight box and set at a considerable inclination from the horizontal to compensate for the difference in level between the empty and loaded tracks.

The most remarkable feature of the installation lies in the tramway buckets, which are so made that they may be placed, two at a time, upon a truck, which is run into the mine and otherwise handled exactly as an ordinary mine car. The loaded buckets are transferred from trucks to cableway at the loading terminal by means of an apparatus called the "transfer table." Trucks come from the mine carrying two buckets, each of a nominal capacity of 2000 lb., although in actual practice, the average weight of contents is 2300 lb. The mine locomotive pushes the cars over a knuckle, whence they coast to the scales. Immediately in front of these are set the blocks or squeeze-brakes, consisting of a pair of heavy timbers, one on each side of the track, clearing the wheels slightly. The other ends are connected with links and levers to allow of their being closed sufficiently to pinch and stop the cars. When the operator releases this brake, the cars coast across the scales into the loading terminal of the tramway.

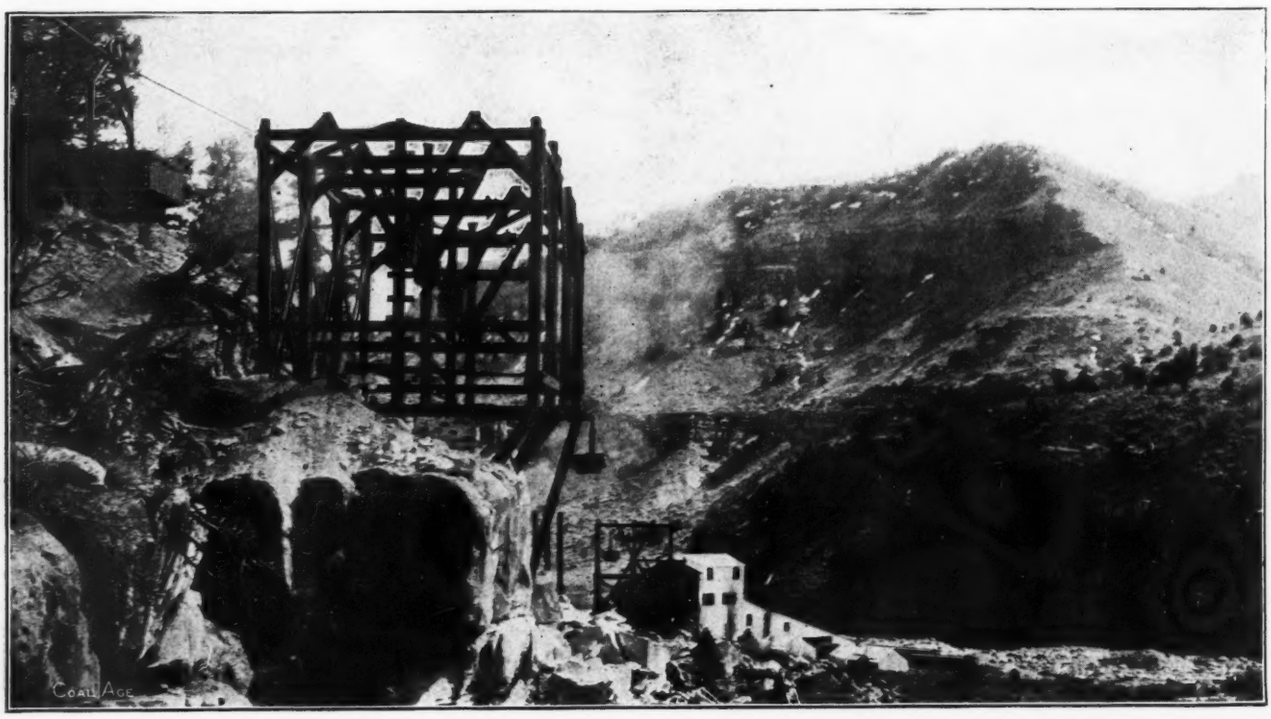
After passing the scales the cars are stopped upon the adjoining transfer table. This is a large platform pivoted at one end, the other being connected to a pair of cranks driven by an electric elevator machine and capable of being raised or lowered as desired. The track crosses this platform near the center, where there is a vertical movement of about 12 inches.

CAR IN POSITION ON TABLE

HANGERS ENGAGING TRUNNIONS

TABLE DEPRESSED, BUCKET HANGING

A pair of hangers having been previously positioned on the overhead rail above the transfer table and pushed outward to clear the approaching loaded truck, the table is raised. This operation brings the platform track level with that of the scales. The car is run upon the platform and the hooks forming the ends of the hangers allowed to fall beneath the trunnions of the buckets. The platform is then lowered which leaves the buckets suspended by the hangers from the overhead rail. They immediately coast to the front of the terminal, where an operator is stationed to space them at regular intervals on the cable. A gong geared to a sheave wheel gives warning when to attach the bucket.



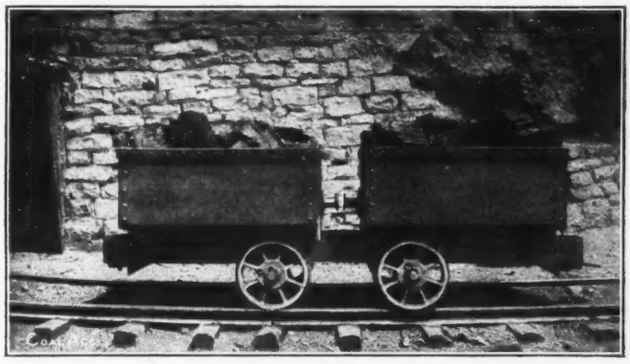
THE FOUR-SADDLE, OVERHANGING TOWER WHERE A DECIDED CHANGE IN GRADE IS MADE

The platform meanwhile remains down until two empty buckets have been positioned over the truck. The operator then throws a switch; the platform rises and the empty truck thereon lifts the buckets clear of the hangers, which are then pushed outward and the latch holding the truck in position on the platform withdrawn. This allows the car to run through a switchback and coast into the mine.

In order to facilitate the rapid handling of buckets two transfer tables are provided, so arranged that one man can operate both at the same time, or either independently. The time for a complete operation on one table is 40 sec., or for the two tables, 50 sec.; but four buckets are transferred with the two tables, while only two are handled with the one.

General Design of Terminals

The loading terminal is located on a ledge of rock, and all available space is utilized to the best advantage. The driving and braking mechanism is placed in an excavation beneath the floor, the traction rope passing around sheaves 8 ft. in diameter to eliminate bending stresses. The track to the kick-back passes directly over the wheel



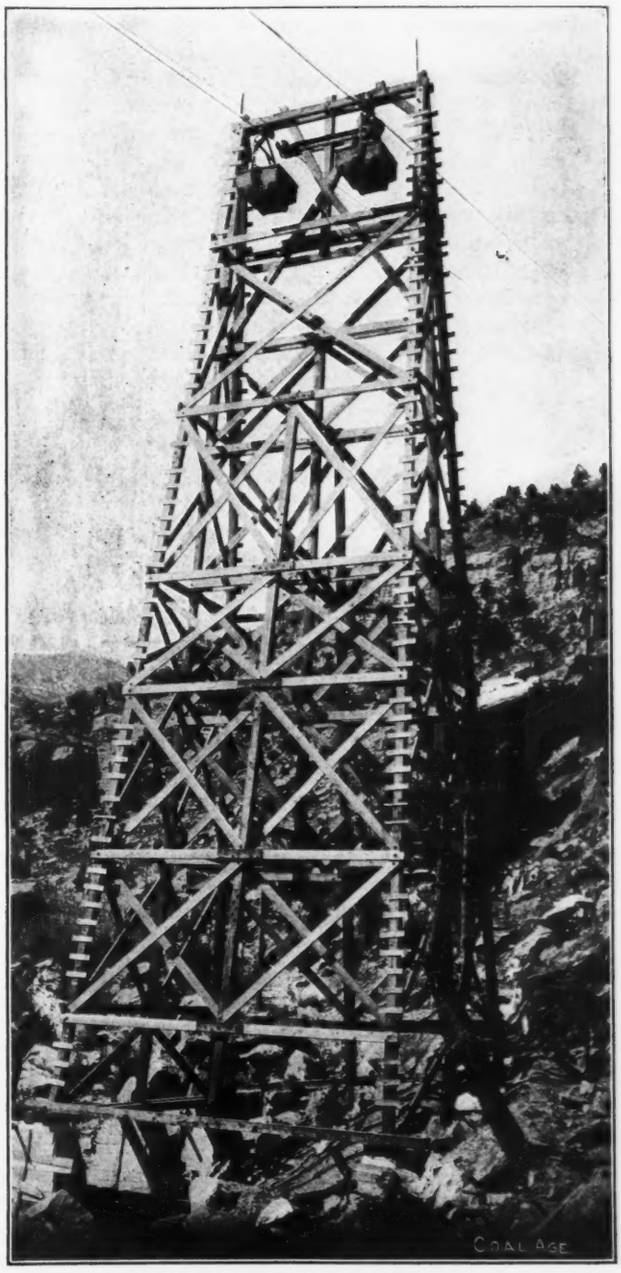
The Two-Bucket Mine Car Showing Trunnions for Attachment to Cable Hangers

pit and between the incoming and outgoing parts of the traction rope.

The track- or suspension-cables for the buckets entering and leaving this station have a difference of elevation of 4 ft., to give necessary grade for the buckets to run freely anywhere in the station without assistance from the operators. The difference in elevation of the cables here required a difference of half that amount on the first tower from the loading terminal. On other towers the empty and loaded cables are carried at the same elevation with the exception of the tower next the discharge terminal, where a difference also exists.

The discharge terminal presents only one unusual feature—that of having the hopper located under a sharp curve in the overhead rail at the extreme end of the structure. This necessitates bringing the buckets to a complete stop in order to dump. The grips employed to secure a hold upon the traction rope are operated directly by the weight of the load they carry. Thus, the heavier the load, the greater the pressure exerted by the jaws. These grips can be relieved only by bodily lifting the load and depressing the tracks simultaneously. This is accomplished in the terminal by attachers and detachers wherein the load is lifted by side rollers rising on incline planes at the same time the track is depressed. This causes the jaws to remain open long enough for the rope to enter or leave the grip as the case may require. This operation is entirely automatic, the grip at all other times remaining closed.

A freight elevator is installed at the discharge terminal to facilitate the transportation of material brought in on the railroad for use in the mine. This elevator is 10x6 ft., with a lifting capacity of 2500 lb. It is equipped



One of the High Tramway Towers

with modern safety speed governor and automatic limit stop, which prevents the platform from running beyond the terminal landing and thereby causing accidents. Material elevated from the ground to the floor of the discharge terminal is conveyed to the mine over the tramway in the coal buckets or by special hangers adapted to such material as steel rails.

Particular attention has been paid to the problem of lubrication, grease cups being provided for all bearings, sheaves and rollers on the entire tramway. The terminals are housed with corrugated iron, which has been painted, as have also the towers, furnishing a pleasing contrast with similar installations often left in the rough state.

A total force of 10 men at $35 per day is required to handle an output of 2000 tons. This brings the transportation charge from mine to tipple to 1¾c. per ton. Had the conditions governing the location of loading terminal and tipple been favorable, this would have been materially reduced.

The tramway was installed by the Spring Cañon Coal Co., an affiliated interest of the Knight Investment Co., of Provo, Utah, to develop its coal land, situated about five miles up Spring Cañon from Helper, on the Denver & Rio Grande. The unusual method of handling the material in detachable buckets is chiefly due to the necessity which always exists in coal mining of handling the coal as gently as possible. In the typical metal mine, the lack of storage capacity, the awkward and easily tipped cars, etc., would prove grave objections. The capacity of the tramway is noteworthy, as is the utilization of the power generated by the descending loaded buckets.

The Waste of Natural Gas

The causes of waste and their prevention are enumerated by Ralph Arnold and Frederick G. Clapp (Bureau of Mines Technical Paper 38, Petroleum Technology 6) as follows:

(1) Waste in drilling and casing wells. In drilling for oil in some districts, gas flows are encountered in sands above the oil. Where the pressure is great, it interferes with drilling and the gas is allowed to escape until the pressure is reduced. In other cases, when penetrating loose formations, the gas may escape around the casing, loosening the ground, and often causing a blowout. Such waste may often be prevented by drilling with muddy water, which tends to clog the pores in the gas sands. In other fields the plan of cementing around the casing is frequently adopted.

(2) Waste from high-pressure wells. In the early days of a gas field, pressure may be so great that a well cannot be capped with means available on the ground. In cases where a heavy flow is expected the size of the bit should be reduced before penetrating the gas-bearing sand. In some fields, the casings are tied together with anchor rods and clamps. It is incorrect to state that wild wells cannot be controlled. Various methods are available, among which are drilling an adjacent well and forcing mud into the interstices of the sand furnishing the flow to the wild well, putting out fires, when present, with steam from a battery of boilers and covering the flowing well with a steel hood.

(3) Waste in oil production. All flowing oil wells are also gas wells to a greater or less degree, and in many cases the value of the gas exceeds that of the oil. The lack of a ready market often operates against saving and selling the gas, and in the early days of oil drilling, gas was considered a nuisance, as interfering with drilling and being a menace from its liability to ignition. Even in established fields a great deal of gas obtained in connection with oil wells is wasted. In California, much of the gas is exceedingly rich in gasoline; it is estimated that in the wasted gas there is gasoline to the extent of 10% of the value of the oil production. A partial solution of the difficulty in new fields is to compress the gas and ship it in steel cylinders. Better than letting the gas go to waste is to burn it under the boilers of the drilling-machine engines. Legislation requiring oil wells to be shut until gas mains can be built would not be disadvantageous to either industry in the long run. The California gas is being utilized more and more for the production of gasoline.

(4) Waste owing to improper care of wells. Such waste includes the handling of wells so that much of the gas is put beyond the possibility of recovery. Gas wells flowing at their full capacity allow pools of salt water to flood the gas sands. It is customary to free gas wells of salt water by blowing the well for half an hour every morning. It is advisable to use only a part of the volume of gas obtainable from a well and thus maintain a back pressure which excludes water. The amount of capacity which should be used varies from 15 to 50%. There is no excuse for blowing the gas in the morning to rid the well of water, since this water can be siphoned off. Many wells are lost through a failure to clean them when the grains of the gas sand have become coated with paraffin or salt. This cleaning should be done by steaming.

(5) Waste in transportation. This is a minor factor in the total of gas waste, but it is important. It takes place through leaks in gas mains; these should never be permitted.

(6) Waste owing to improper plugging. Dry and abandoned wells when unplugged permit water to flow in and drown the gas sand. Legislation requiring such holes to be plugged should be provided in all states.

(7) Waste in utilization. The elimination of waste in consumption is unquestionably the most important field in which the principles of conservation can be applied. This applies to gas as well as other natural resources. Such waste includes the sale of gas at a flat rate, its burning in improper burners, its use under boilers, its burning during the day time, and its sale at too low a rate. It should be used for the purpose for which it is most valuable, in the manner that is most efficient, and as near as possible to its point of production. The most valuable purpose for which natural gas can be used is as domestic fuel and illuminant. When it is to be used for the generation of power, it should be applied to an internal-combustion engine and not burned under steam boilers. For transportation to any distance, extensive mains and pumps are necessary. It is cheaper to establish the industry utilizing the product near its source. As an illuminant, gas should be used always with a mantle, which increases its efficiency almost 10-fold. Its economical use should be promoted by its sale at a higher rate, inasmuch as when it is abnormally cheap there is an irresistible tendency for the consumer to waste it at the ultimate expense of the community. Further, waste by the consumer should be discouraged by its sale on the meter system, which it is estimated will cause a saving of 60 to 70% over the flat-rate method.

The Leadville Tonnage of Zinc Carbonate Ores which was largely decreased owing to the low price of spelter, will from now on be increased again, as the smelters' contracts have been modified to benefit the shipper.:

Nechi River Placer Mining, Colombia

By William F. Ward*

SYNOPSIS—Pato and Pochet dredges are operating with success. Farley and San Carlos hydraulic properties are somewhat important. Other small placers contributed to total output. Transportation chiefly by river. Placers capable of more rapid development than are the lode properties.

There has been much interest taken recently in both placer and lode mining in Colombia, South America. The portion of Colombia with which I am most familiar is comprised in the lower Cauca and Nechi River districts. At present, the Nechi River district is the best developed and several successful placer and lode mines are now in operation there. The map, Fig. 1, shows the situations of these mines.

The placer mines are represented by the Pato company, the Pochet company, the San Carlos mine, and the Farley mine; and the lode mines by the Frontino Bolivia, Sucre, and Guamaco. In addition there are numerous small mines, both placer and lode, which are working successfully.

Pato Dredging Properties

The Pato company is controlled by Oroville Dredging, Ltd. It has large holdings on the west side of the Nechi River, owning all the placer land from San Juan Creek to a point opposite the mouth of the Bagre River, with the exception of one or two claims opposite the town of Zaragoza.

A 9-cu.ft. modern electric dredge started to operate on Jan. 2 this year. On Jan. 14 an accident caused a shutdown for about a month and a half; since that time it has been operating satisfactorily. This dredge was expected to be in operation over a year ago, but much time was lost and more money than at first estimated had to be expended on the San Juan Creek dam for the electric-power plant.

In excavating for the dam foundation, it was found that the rock was not firm, and a great deal of material had to be removed before it was safe to start the concrete work. At the dam site, the creek was on bedrock and the sides were of rock. But, as often happens in the tropics, rock decomposition was extensive both in depth and laterally. A ditch was proposed at first, but mainly owing to the experience of the Frontino Bolivia company with its power-plant ditch, this was given up as impracticable. The heavy tropical rains cause frequent washouts and landslides.

The dredge is starting on a tract of 300 acres, proved by drilling to run about 31c. per cu.yd., chiefly in the first bench of the Nechi River. This first bench, as well as the higher and older benches, is red, due to extensive oxidation. The bedrock of the first bench here is at about the level of the river, and the dredge is able to start work in Pato Creek and work up into the bench gravel. There is an older and higher bench near by that has been partly worked by native methods. This will probably be worked by some sluicing method, making use of the extra power provided by the electric plant. Up to the present time much of the property, especially the most northern portion, has not been drilled.

*Mining engineer, 416 E. & C. Bldg., Denver, Colo.

Pochet Dredging Company

The next most important operation is that of the Pochet company. Near the mouth of Hebilla Creek a 5-cu.ft. steam-driven dredge has been working since 1909, and small-scale sluicing operations are carried on in the upper, older bench. This last work is conducted only in the rainy season on account of the small water supply available.

As the Pochet dredge is the first successful dredge to operate in Colombia, a detailed description may be of interest. Fig. 2 gives an idea of its size and design. It was built by the Werf Conrad company, Haarlem, Holland.

The hull and all the framing is of steel. The chain carries 5-cu.ft. alternate buckets, and digs to a depth

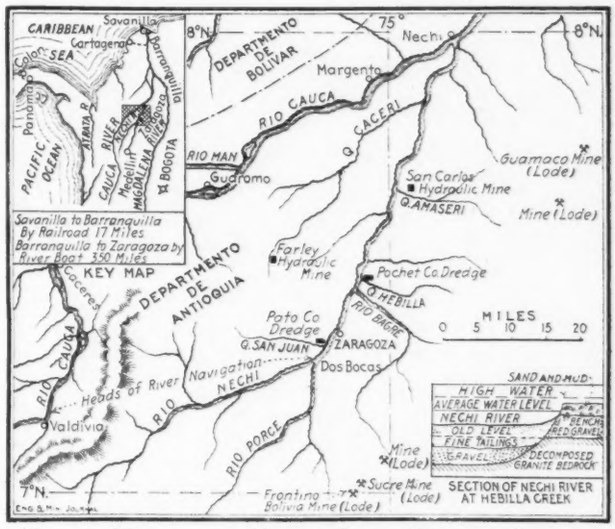


Fig. 1. Map of the Nechi River Mining Region

of 26 ft. under water. The dredge is of the Risdon type, working with a head line, and has the usual bow and stern lines. It has a revolving screen and the usual tables; the stacker is of the steel-bucket, old Risdon type. The dredge is steam driven, using two locomotive boilers, fired by wood fuel. One large upright engine drives by belt the bucket chain, revolving screen and stacker. Another upright engine runs the centrifugal pump. A duplex pump furnishes water for the surface condenser and part of the wash water. A small winch on the left side operates the head line, and the left bow and stern lines. Another winch on the right side operates the ladder hoist, and the right bow and stern lines.

Native Colombian Crew

In place of one winch man, as is the American practice, there are three required, one at the digging-engine valve and one each at the left and right winches. The rest of the crew consist of an engineer, a fireman, a wood passer, a table man, an oiler and two deckhands. These 10 men with the dredge master constitute the regular crew, and most of them are of negro blood, picked up locally.

There is also a master mechanic, blacksmith and helpers, in the machine and carpenter shops. The wood is cut by contract and taken to the dredge in canoes. Clearing the ground is an important feature, and keeps a special crew busy. The usual Colombian native does not care to work steadily, so that, counting all men more or less employed, outside, on the dredge, in the shop, store and office, the total is about 70. The total expense, however, is small, the usual laborer getting a dollar a day and boarding himself.

The manager and mine owner, L. G. Pochet, has made his home in Barranquilla for some time, and was successful in other lines of business in Colombia before taking up dredging. It is due to his energy and competent management that dredging here has been a success. The remarkable part of it is that he has attained his success entirely with native Colombian mechanics and laborers.

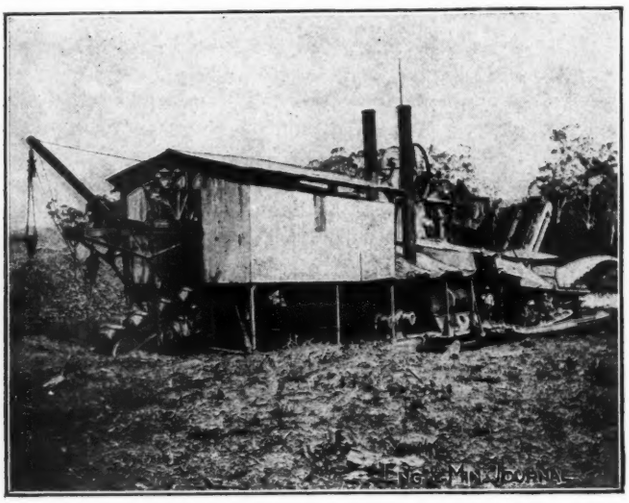


FIG. 2. THE POCHET DREDGE AT WORK

FORMER FAILURE OF THE DREDGE CONVERTED INTO SUCCESS

The dredge works only in the day time and occasionally up to 10 p.m. with the same crew. The occurrence of large stumps and buried timbers operates against night work. With all the disadvantages of tropical work, however, the cost per cubic yard compares favorably with that got with steam-driven dredges in the United States. Also I may mention that the yield per cubic yard is much higher than that of any dredging ground in the United States.

The dredge was first assembled at Barranquilla by Colombian mechanics and towed far up the Magdalena River, where a foreign company tried to operate and failed. It was then towed back and up the Cauca and the Nechi Rivers to the point where it is now working. The foreign company here again failed to make good. It did not work long enough to overcome the usual little mechanical difficulties that are familiar to all dredge operators, nor could it save the fine gold with a small surface of coco matting and in the absence of riffles and mercury.

When Mr. Pochet came into possession, he made the necessary changes and scored a success, an example of a man of good judgment and a thorough knowledge of native labor succeeding where a foreign company with seemingly the best of foreign engineering advice, failed to make good.

The chief changes Mr. Pochet made were to increase the furnaces to burn wood fuel properly, adjust the machinery properly, increase the table surface and use riffles. He also uses woolen blankets next to the screen. These blankets are followed by riffles of the usual California type with mercury.

The gold obtained is extremely fine. A fair sample gave about 13 colors per mg. This was gold obtained from the blankets where no mercury had touched it. Once in a great while colors weighing as much as ½ mg. can be seen. The gold is extremely pure, as is usually the case with small-sized colors. Some shipments have assayed as high as 920 fine.

NATURE OF THE GROUND

Fig. 1 shows a section near the mouth of Hebilla Creek, where tailing due to former placer operations in the upper Porce and Nechi Rivers, has filled up the river bed for about 30 ft. Of this, 15 ft. has been filled in during the memory of the oldest natives on the river. So at present the first-bench red gravel, which was formerly above the level of the river, is now for the most part under water. Large stumps and fallen trees that once grew on the first bench are now buried 10 ft. deep in sand and muck; there is also a growth of trees upon the sand and muck; and since most of the tropical woods sink in water, the trouble given to a small, light dredge is tremendous. Ground that at present looks like swamp and low timbered ground, may have below it the valuable first-bench gravel. Mr. Pochet found his richest ground by prospecting with the dredge into the river banks. Now, however, he uses a hand drill to advantage.

The valley is flat, about four miles wide, and entirely covered with muck, sand and tailing deposited since the Spaniards occupied the country. The main bed of fresh river gravel may also be valuable, but in either bench or river gravel systematic drilling is necessary to locate pay ground.

The red oxidation color of the first-bench gravel shows that it was originally above water level. At times old native tools, such as parts of wooden *bateas* and rusty picks are dug up by the dredge from near the bedrock of the first-bench gravel, now 15 ft. below the lowest water. Generally these old workings are found under 25 ft. of sand and muck, and invariably the few feet of undisturbed gravel remaining is extremely rich. The first-bench deposit, except for the sunken timber in the muck proper, is ideal dredge ground, the gravel being small, bedrock soft, usually decomposed granite and gneiss, and the colors rarely lying directly on the bedrock itself.

As the dredge digs only 26 ft., it is necessary to work at different places according to high or low water. Sometimes this means changing position every few days. There is no danger to the dredge from floods, as the Nechi is a large, navigable river. When extensive repairs are required, the dredge is simply towed down to the shop. Ordinarily repairs are made by taking the parts to the shop and back in native canoes.

The Farley hydraulic mine is situated on the upper part of Caceri Creek, at an elevation of about 4000 ft.; it is owned and run by an American. Two monitors operate night and day on the 100-ft. bank of gravel.

While the ground is not rich for Colombia, the mine pays well. The equipment and methods are not uptodate, but results are successful. The greater part of the gravel is small in size and of the usual red color.

There is some coarse gravel and a few boulders in the lower part. The bedrock is a hard and somewhat uneven gneiss. The tailing is taken care of by the swift Caceri Creek. The boulders and coarsest pebbles are piled up by hand after the native method. Mercury is used in the long sluice. The water supply is good, being helped out by a reservoir in the dry season.

San Carlos Hydraulic Mine

The San Carlos mine is situated about two miles north of Amaseri Creek and six miles east of the Nechi River. It is owned by a French company that worked it for several years by the hydraulic method, pressure being supplied by a steam plant. A great deal of gold was taken out, but the expense is said to have equaled the returns.

At present the mine is leased to a storekeeper in Zaragoza, who makes it pay on a small scale by using the natural water pressure. He attempts to work only during four or five months of the year when the water supply is sufficient. The tailing is run off into a small stream that leads into the Nechi River. This bank of gravel is about 60 ft. high and differs from anything I have seen in the district, in that it is white in color. Although it is distinctly bench gravel, it carries so great a percentage of quartz pebbles and rocks and so little iron that its color is practically white. It must be mainly old Amaseri Creek gravel. So far only a small part of the total has been worked.

Small Native Placers

Several Colombian-owned mines are in operation on the richer channels of the bench gravels. They are known as "bar" mines from the use of the crowbar in breaking down the gravel. A small stream of water is allowed to flow over the bank and the gravel is washed, the coarser tailings being piled by hand. Lack of sufficient wash water and lack of grade for the dump is a common disadvantage in these large bench deposits. From these mines the Zaragoza storekeepers buy about 40 lb. of gold monthly.

There are also in the district numerous old workings and old tailing piles. Judging from the native working costs today, the ground formerly worked must have averaged at least 40c. per cu.yd. At a few places close to the Nechi River can be seen the remains of machinery of foreign companies, none of which made a success. They were all intended to work unprospected ground supposed to average $5 and $10 per cu.yd., but never got beyond clearing, erecting houses and setting up a steam pumping plant. Some ran for a few days and possibly recovered 5c. per cu.yd. Colombian natives do not leave rich banks of gravel close to the river; they are placer miners themselves and have more sense than most foreigners give them credit for.

Climate, Transportation and Future Development

The climate in the Nechi placer field is tropical, the elevation running from 400 to 500 ft., the temperature being often 90° in the shade in the day, and 70° to 75° at night. Malarial fever is common and practically all natives and foreigners get it sooner or later. The climate in the high elevations, 4000 to 6000 ft., is delightful and fairly healthful.

At any time of the year the river steamboats can get up to the mouth of the Bagre River on the Nechi, and up to the mouth of the Man River on the Cauca. To reach the upper heads of navigation, Dos Bocas or the junction with the Porce on the Nechi River, and Valdivia on the Cauca River, there must be medium or high water.

There has been for some years a regular boat to Zaragoza, due to the operations of the Frontino Bolivia lode mines, and to the regular cattle trade with the upper country. At all times freight canoes are going up and down the river, and a person can travel the river by canoe and can also go many miles up the side streams.

Development along placer lines should be most rapid, since the navigable rivers reach close enough to the gravel deposits to enable prospecting drills to be brought in. Lode-mining development will be slower on account of difficult transportation, but possibly will be finally far more important. Lode prospecting also is slow, as the tropical growth of trees, grass and underbrush greatly retards the work.

California Mineral Industry

The California State Mining Bureau has been engaged in collecting statistics regarding the mineral production of the state for 1912, which, while not yet complete, are enough so to give a clear idea of the condition of the industry for the year. Forty-two mineral substances were commercially produced, varying in value from petroleum, with an approximate value of $43,000,000, down to manganese, worth about $200. The mineral products, which were valued at over $1,000,000, include petroleum, gold, cement, copper, crushed rock, brick and borax. The value of these seven materials is about $80,000,000, or eight-ninths of the value of the entire mineral output. The remaining 35 substances make up the balance.

The sole United States production of borax, magnesite and chrome is from the State of California, while 80% of the domestic supply of quicksilver is mined in the state. Tungsten is produced in but two or three other states. The production of petroleum and also of gold is greater than that of any other state in the Union.

It is first of all states west of the Mississippi, with a value of total mineral production, and is only outranked by a few of the great iron and coal-producing states in the East. Each of the 58 counties in California produces mineral of some description, with values ranging from Kern with a $22,000,000 output, down to Tehama, with a production of only a few hundred dollars.

Kern County is the leader in petroleum production, while Amador and Yuba are close rivals for first place in gold output. Shasta produces 80% of the total copper output. Los Angeles leads in brick and crushed rock, while Inyo is first in borax, lead, soda and zinc. San Benito is first in quicksilver production, and San Diego County produces half of the gems found in the states. Placer County is first in granite and building stone, Santa Cruz in lime, San Bernardino in limestone, and Tulare in magnesite.

A New Refractory Material

It has been found that boron nitride is completely infusible at the highest heat of the electric arc and also is chemically inert. It has extremely high resistance to the passages of electrical current, even at the temperature of the carbon arc. These facts have been discovered by Ezechiel Weintraub, of Massachusetts, and patented under the U. S. No. 1,063,083. The patent is assigned to the General Electric Co., of New York.

Carbon is about the only other substance known to have such refractory nature. Unlike carbon, boron nitride has no chemical tendency to unite with other materials which are likely to be used as a charge in an electric furnace. When finely divided, it has the property of being self-bonding, so that no binder is necessary and the purity of this material may be preserved when making containers of all kinds. It should be heated in an inert environment such as in a neutral gas or in a vacuum. For this reason furnaces designed to use this material should be equipped with pipes through which any particular gas may be continuously passed in and out of the furnace, or which may be closed and the furnace evacuated.

Boron nitride can be prepared by any one of the methods recommended in the literature, such as passing ammonia over boric anhydride mixed with calcium phosphate at a red heat, or by passing ammonia over amorphous boron, or by bringing together boron chloride and ammonia and decomposing afterward the double compound formed.

❋

The Economy of Dry Blast

In a paper read before the Iron & Steel Institute, May, 1913, Professor Joseph von Ehrenwerth considered the economy of dry blast in smelting operations. Gayley's system, as practiced at the Etna blast furnaces, consisting of freezing out the moisture in the blast, proved so astonishing that additional investigation was undertaken by Professor von Ehrenwerth, who arrived at the following conclusions:

That the economic advantage of drying the blast is greater the lower the temperature of the blast and the higher the temperature of the waste gases at which the furnace previously worked. This resulted naturally from the saving in fuel, from the smaller expenditures of heat in decomposing the small amount of moisture left in the blast, and from the formation of a smaller quantity of gases which give up their heat more quickly and completely as they rise through the furnace more slowly and escape at a lower temperature. The heat losses due to conduction and radiation are therefore also reduced in proportion as the waste-gas temperature is lowered.

In consequence of the economy in fuel, the total quantity of material charged, and therefore also its volume, is less, and the volume of blast required is smaller per unit of production. If the periods between tapping remain the same, the blowing engine and stoves, without increasing their duty, should cope with a larger production, and the furnace yield should therefore be increased, as is in general proved to be the case in practice.

The quantity of gas formed within the furnace being less, owing to the dryer condition of the blast, the temperature in the melting zone must be higher. The melting process is therefore theoretically not only accelerated but the silicon percentage is increased, and the quality of the pig iron as regards sulphur is improved. This too has been found in practice to be the case.

The removal of five grams of moisture per kilogram of air is accompanied by a rise in temperature of about 32° F. to 35°, which corresponds to an increase in the temperature of the blast of about 40° to 45°. In this respect the drying of the blast is similar in effect to the heating of the blast, though with the important difference that, by drying, the quantity of the waste gases diminish, whereas by heating only they remain the same.

Another natural consequence of using blast with a uniform quantity of moisture, such as can be effected by drying, is that more regular working of the furnace is assured, an advantage which Gayley regards as superior to that of economizing the fuel. As is well known the fuel charged into the blast furnace adjusts itself to the performance of three functions during the course of the whole process, namely, one portion effects reduction, another the carburization of the iron, a third is utilized for heating, while a fourth portion is wasted through being carried off in the form of dust in the gas.

Practical tests have shown that by reducing the moisture of the blast the smelting process is accelerated and the quantity of dust in the gas and the losses of material charged are reduced, this being the natural result of the lower velocity at which gases escape. Gayley reported the same experience at the Etna works.

In practice the difference in fuel consumption due to the different moisture conditions of the atmosphere in summer and in winter, is not so great in modern coke blast furnaces as one might expect. This is undoubtedly due to the fact that the furnaces are, as a rule, not well protected, and the radiation losses, which are at all times proportional to the time taken to reduce the charge, are higher in winter than in summer, and so more or less counteract the effect of the dryer air.

Apart, however, from the other advantages resulting from drying the blast and having regard to the saving effected in fuel consumption alone, it has been shown that whereas the economical result of drying the blast in some instances is remarkable, it varies considerably, and the question of introducing it must be settled on its own merits. The advantages are dependent in every case on local conditions, such as the dampness of the atmosphere and the cost and quality of the fuel. They are influenced besides by the kind of products, the quantity of output, the reduction period, and the type of furnace. Assuming that the condition of the atmosphere as regards moisture is high enough, the adoption of dry blast is certain to prove advantageous under the following conditions:

(1) For blast furnaces working with high blast temperature, and yet with high waste-gas temperature, such as furnaces smelting ferromaganese, ferrosilicon, or ferrochromium. (2) For blast furnaces in localities where the atmosphere is particularly moist, such as on the coast, more especially in southern countries. (3) For blast furnaces which work with high fuel consumption and with waste gases at high temperature and produce pig iron, the composition of which requires careful control, according to the purpose for which it is destined, such as bessemer pig, foundry pig, and high-silicon pig generally.

Michigan Copper Strike

The proposal of Governor W. N. Ferris, of Michigan, for a meeting between five representatives of the mines and five of the miners was refused by the companies on Aug. 1. The text of the companies' letter explaining this refusal follows. This was presented through General Abbey.

In response to the message from his excellency, the governor of Michigan, to the mine owners and employees involved in strike, to which we have given careful consideration, we, who are the managers and superintendents of the mines affected by the existing situation, on behalf of the several companies and their numerous stockholders, as well as on behalf of the employees who in a large majority have been and are, not only willing, but anxious, to continue at work, desire to express to you, and through you, to the governor, our high appreciation of the offer of his services in the pending dispute and our deep obligation to him therefor.

With great regret that the circumstances seem to us to render it necessary, we feel obliged to say that for the welfare and good name of the state as a whole, for the best interests of our employees, for the interest of this entire community, and as making for continued and lasting industrial peace and quiet in this district, we should not and cannot enter into or take part in a joint conference with the leaders or representatives of the Western Federation of Miners, which organization is solely responsible for the conditions now existing, nor with any representatives of those who are actively engaged in the strike, and who falsely assume to represent the great body of our employees.

In thus stating our position, we feel that it is due to his excellency, as well as to yourself, that we should also state our reasons for this conclusion.

FIFTY YEARS OF PEACE

The copper-mining district of Michigan has operated its mines on an extensive scale for upward of 50 years. In all that time there has been no general strike among the employees. There has never been any serious labor disturbance or dispute. The few which have occurred locally at some mine locations have been speedily and satisfactorily adjusted between the managements and the employees. There have been satisfaction and contentment on the part of those employed and good feeling and mutual respect between employers and employees. We believe it can be said truthfully that in this mining district the conditions of labor, the consideration for the employees, the means taken for their comfortable housing, for their general welfare, for their health, for the education of their children, and their fair and generous treatment in every respect have not been excelled anywhere in any industry of like kind.

FEDERATION'S RECORD

The history of the Western Federation of Miners is well known. That organization was directly responsible for the strike in the Cœur d'Alene district, the Homestake strike, the strike on the Mesabi range in 1907, the recent strike in the Porcupine district in Ontario, the strikes at Bingham and at El Paso, and others which may be recalled. Each of those strikes was accompanied by lawlessness, riots, assaults, volence, destruction of property and bloodshed. They resulted in the bloody riots of Colorado, the blowing up of the railroad station with great loss of life, the assassination of Superintendent Collins, of the Smuggler Union, the blowing up of Bulkley Wells, of the Smuggler Union, the murder of ex-Governor Steunenberg, of Idaho. Some of these strikes were under the leadership of some of the leaders of the present one. All of them were organized, incited, instituted and called by the Western Federation of Miners.

About the year 1907 this federation, with such a record behind it, began to send its organizers from the West into this district. They have carried on a systematic attempt to secure the complete domination of the mine laborers of this district.

They have attempted to breed and engender discontent among some 20,000 employees of the mining industry and it is but natural that they secured many recruits. For a long time it has been definitely known that as soon as their leaders felt that they were strong enough, a strike would be called.

It is reliably known to us that the federation succeeded only in a small measure in attracting to itself the employees of the mining industry in this district. The majority and, on reliable information the large majority of the employees declined to affiliate with them. On direct information, a large number believed that they had no grievance to strike for and did not wish to strike; on reliable information, the greater part of them desired to continue at work, and now desire to resume work.

CAMPAIGN OF RIOT

On July 23, the strike called by the Western Federation of Miners took place. It was and is under the direction of skilled and experienced strike leaders of the federation, who are not residents of this district, or of this state. The strike took out only those affiliated with that organization on the morning when it went into effect. Many of our employees continued at work for the day. A campaign of violence and riot was at once instituted. The officers of the counties were without power to maintain order or to restrain lawlessness.

By threats publicly made, including threats of destruction of their homes in their absence, violence to their families and death to themselves, the men of the night shift were deterred from going to work underground.

Mechanics and laborers were driven from their employment by riotous mobs, armed with firearms, clubs, rocks, iron bars and other weapons. Mechanics, miners and laborers who desired to work or while at work, were cruelly beaten and many were severely injured.

One man, 75 years of age, who had worked in the mine for more than 30 years, was beaten and seriously injured. Another of like age was driven from his work at the point of a gun. The officers of the law were helpless, derided, cursed and their authority ignored.

OFFICERS ASSAULTED

A deputy sheriff's star was a signal for an attack on the wearer. Officers were assaulted and beaten. Active resistance undoubtedly would have resulted in the destruction of property and the loss of many lives. A store building and its contents were burned after the proprietors announced that they must refuse credit.

The men were driven from the pumps and the mines were flooded with water, causing great destruction and damage. At some of the mines, even the operation of pumps for the fire protection of the community was forcibly prevented and the men driven out. At every branch of the mining industry at the several mining locations, the labor of the employees willing and anxious to work was stopped forcibly, riotously by threats and intimidation, by violence and assault, by woundings and beatings.

For the remainder of the week, every mining location was wholly at the mercy of these rioters, and millions of dollars worth of property absolutely in their hands. All this was but the repetition of the results which have invariably followed the calling of a strike by the councils of the Western Federation of Miners. Of their membership in this community, many of our employees, since the strike was instituted, have been taken from their homes and intimidated and forced under threats into joining the Federation. The strikers have paraded by day and by night, armed with weapons of all kinds, and have forced men, unwilling to do so, to join their parades. The large majority of our employees at the mine location were for the time terrorized into submission to these riotous strikers, who are those who have affiliated with the Western Federation of Miners, and none others.

There was no call by these strikers for conference, or for mediation or for adjustment while they thus completely dominated the situation.

There is, therefore, no industrial dispute between the mine owners and employees. Under the circumstances, and because of our knowledge that the majority of our employees have at no time sympathized with the purposes of the federation, and have been and are now willing and anxious to continue in their employment, we cannot recognize the right of the Western Federation of Miners to intervene or to assume to represent our employees with respect to the present conditions, or in any other manner whatsoever.

WILL NOT RECOGNIZE FEDERATION

The suggested joint conference of both sides could mean nothing other than a conference in which one side would not be our employees or representatives of our employees, but would be the Western Federation of Miners, or its representatives, whose sole object is undeniably to establish the federation in a dominant control of the mining industry of this district. With them we cannot confer, and with all respect to his excellency we feel that we cannot enter into a joint conference with, or in any manner recognize, that organization, which most certainly to our knowledge does not represent our employees, with the great majority of whom we have no dispute of any kind.

It has continuously been the practice in the past, and will continue to be the practice in the future, for managements of the various companies to confer in a friendly way with their own employees, or with representatives of their employees, on

any matter relating to improved working conditions, or real or supposed grievances, and willingly to redress or correct any wrongs. No intervention of any kind was or will be necessary for such joint conferences; but to confer or treat with an organization foreign to your territory and to the interests of our employees, and not in any manner representing them, is something which we cannot contemplate.

We desire to be clear and emphatic in conveying to you our opposition to the Western Federation of Miners, in the firm belief, based upon its record, which is a matter of history, that the domination of this district by that particular organization, for which purpose alone this strike has been incited and instituted by that organization, can result in nothing but harm to the best interests and welfare of our employees and of this community, and can conduce to nothing but a continuance of discontent, which is their doctrine, and a constant recurrence of lawlessness and disorder, which seem to follow upon their methods.

DANGER CONTINUES

In spite of the beneficent effect of the presence of the Michigan National Guard under your efficient command, which has given to the people and the business interests of this community a feeling of confidence and a comparative peace and quiet, yet the intimidation of our employees, threats of personal violence, of the destruction of property and even of the taking of human lives, continue to this day. No later than yesterday employees of more than one of our companies, nonsympathizers with the Western Federation of Miners, were set upon and cruelly beaten. Under no circumstances would we consent to confer with strikers or representatives of strikers or to compromise any differences or consider alleged grievances with a body of men who are thus lawlessly conducting themselves.

Under all the trying circumstances of the riotous proceedings of the days before your arrival, we have refrained from the employment or the use of private armed guards. In the belief that the prevention of bloodshed was the first and highest consideration, we prohibited and prevented the use of firearms or deadly weapons against those who were attacking our property and our employees. We have relied solely upon the constituted authorities for their protection. The local officers of the law with consciousness and zealous desire to that end, found themselves without power to cope with the lawlessness, disorder, violence and riotous conduct which ensued from the first inception of the strike. Through the request of his excellency preferred by officials charged by law with the exercise of discretion in the matter, the Michigan National Guard under your command has come to this community for the sole purpose of the maintenance and enforcement of law and order, without favor either to mine owners or strikers.

NO IMPORTED MEN

We have imported no strike breakers. We have imported no mechanics, miners or laborers. Our old employees, to a large majority within our own knowledge, who have no grievance and with whom we have no dispute, are willing and anxious to resume their work from which they have been driven by force and violence on the part of a comparatively small, but well organized and well officered body of strikers who have submitted themselves to the influence and domination of the Western Federation of Miners.

Our only request to the great commonwealth of Michigan is that our old employees who are willing and anxious to resume work, may be permitted to do so without molestation from those who have undertaken and thus far succeeded by intimidation and personal violence, in preventing them in the exercise of the right which the laws of Michigan assure to them, to labor without interference or molestation. If our employees could today be assured of their entire freedom from unlawful molestation, if they could feel sure that their homes and their families would be safe in their absence, we should be assured of an immediate or speedy settlement, not of an industrial dispute which has no existence, but of a situation which, if continued, will mean that the organization known as the Western Federation of Miners, its local councils and those of our employees who have affiliated with it and who alone constitute the active strikers, are not amenable to the laws of this state.

We have every assurance and a confident belief that our attitude as herein stated to you, with reference to the present deplorable situation and with reference to the domination of the district by the Western Federation of Miners, has the hearty support and approval of the entire business interests and the responsible citizenship of this community.

It is our belief that the best and highest welfare of this great commonwealth of Michigan demands, as a foremost consideration, that its laws be enforced, that lawlessness, violence and disorder be restrained, and that the miners, mechanics and laborers who desire to work be permitted to do so without violation, on the part of any organization, combination of strikers or individuals, of the statutes which make it an offense against the peace and dignity of the people of the commonwealth, by threats or intimidations or otherwise, and without authority of law, to interfere with or in any way to molest or disturb any mechanic or other laborer in the peaceful pursuit of his lawful vocation.

We again wish to express our profound appreciation of the offer of his excellency communicated to us through you. If the situation were such as to admit of the suggested joint conference, we should gladly and thankfully accept the offer of his excellency, the governor. We trust that we have shown by the statement of a situation which can be fully substantiated, sufficient reasons for respectfully declining to enter into any conference with the Western Federation of Miners or its representatives.

We also wish to express to his excellency and to yourself our full appreciation of the prompt action which resulted in the presence in this district of the Michigan National Guard, which under your efficient command, with favor toward no interest either of mine owners or employees, has in so large a measure restored to this community that peace and order and observance of law which makes in the highest degree for the welfare of the community and of the entire state.

THEODORE DENGLER, JAMES MacNAUGHTON,
R. M. EDWARDS, F. W. DENTON,
J. L. HARRIS, CHARLES L. LAWTON,

July 30, 1913.

Mineral Production of Japan

A report on the mineral industry of Japan submitted by the British Legation at Tokio, gives some interesting figures. The production of coal and other non-metalliiferous minerals is given as follows:

	1911	1912	Changes
Coal, tons	17,632,710	19,794,870	I. 2,162,160
Peat, tons	97,656	102,830	I. 5,174
Graphite, lb.	254,265	328,933	I. 74,668

The production of metals and ores is stated as follows:

Metals:	1911	1912	Changes
Copper, lb.	118,670,320	137,752,866	I. 19,082,546
Lead, lb.	9,166,615	7,962,146	D. 1,204,469
Tin, lb.	55,205	79,536	I. 24,331
Pig iron, ton	53,426	57,155	I. 3,729
Steel, tons	10,366	12,265	I. 1,899
Ores:			
Tungsten ore, lb.	262,767	359,144	I. 96,377
Manganese ore, tons	9,613	8,632	D. 981
Chrome ore, tons	1,500	1,459	D. 41
Iron pyrites, tons	72,569	87,172	I. 14,603

Lead was the only metal showing a decrease last year. The mineral industry appears to have been generally active and prosperous.

Goldfield Consolidated

Total production of the Goldfield Consolidated, Goldfield, Nev., during June, 1913, was 30,486 tons of ore, from which resulted net realization of $180,782. Mining realized $57,005, and milling, $123,777. Development amounted to 3323 ft., and cost $599 per ft. The accompanying table shows the combined operating cost of mining and milling companies.

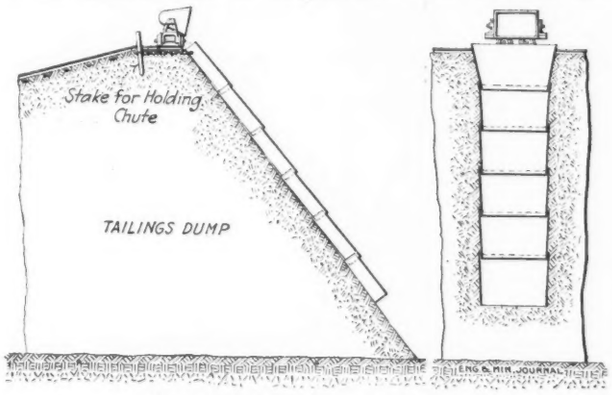
	Mines Co.	Milling & Trans. Co.	Total
Mining-stoping	$2.69	....	$2.69
Development	0.65	....	0.65
Moving dumps	0.02	....	0.02
Transportation	....	$0.09	0.09
Milling	....	1.91	1.91
Marketing	....	0.05	0.05
General expense	0.26	0.02	0.28
Bullion tax	0.06	....	0.06
Construction	0.04	0.02	0.06
Marketing ore shipped	0.98	....	0.98
Total costs	4.70	2.09	6.79
Miscellaneous earnings	0.03	....	0.03
Net costs	$4.67	$2.09	$6.76

DETAILS OF PRACTICAL MINING

Improved Distributor for Fine Material on Dumps

The accompanying sketch shows Chergwin & Tregoning's apparatus as used at the tailing dumps of the Robinson and City Deep Mines. As quartz sands tend to accumulate toward the top of the dump, rendering necessary the moving of the track frequently, it has been customary on the Rand to keep a gang of 10 to 20 natives stationed below the brow to shovel away the contents of the trucks as tipped.

The apparatus consists of a number of chutes. In these the angle of repose of quartz grains is much steeper than of sand on sand, so that it is possible to convey a large quantity of material to the base of the dump at first with a long chute. This may then be flattened until the material will no longer run. The chute is then



SAND TAILING DISTRIBUTOR

shortened by taking off a section. The cost of a section of a chute suitable for single trucks is £1 and four complete chutes can be erected for £100, the sections being of light steel riveted plates. Besides these only a chain and a stake are necessary.

Sinking an Untimbered Shaft

The method of sinking shaft No. 6 of the St. Louis Smelting & Refining Co. in southwestern Missouri was novel in that it was carried down through limestone for 557 ft. without timbering and by means of a derrick instead of a headframe. The manner of using the derrick has been described in the JOURNAL, July 19, 1913. Air pipe was not installed in permanent form until the completion of the shaft. No pumping was necessary, and only some slight timbering, where the limestone was badly shattered. A speed of 100 ft. per month was maintained. After the bottom was reached, timbering was done, working from the bottom up. Electric lights were strung through the shaft while the permanent timbers and pipe were being set. The end of the derrick boom also carried a cluster of electric lights for illuminating the ground around the collar of the shaft. Mucking was done by means of a cluster of electric lamps on the end of a wire raised and lowered by a reel at the collar. To provide against failure of the current, two torches were always kept tied to the bucket.

Safety Rules—Electrical Haulage Underground*

(1) Operators should see that their motors are in good working order and furnished with the necessary tools, supplies and signals. They should thoroughly inspect the motor and test the brakes at the beginning of each shift; see that they have a supply of sand; and immediately report any defects to the master mechanic.

(2) They should not leave the motor except in case of necessity, and then have some competent person in charge. No one except motormen and electricians should be permitted to operate the motors.

(3) Operate cars at such a speed as to have full control at all times. Avoid bumping cars violently.

(4) The trolley pole should follow and not lead the motor, except in places where this is impossible. When the trolley pole is ahead the motor should be moved slowly.

(5) The trolley pole should not be turned while the motor is in motion.

(6) There should be a red light on the advancing end of all trains when the motor is not in front and the light on the motor should be kept lighted at all times when the motor is in use.

(7) Motormen should ring the bells on their cars at frequent intervals and especially when approaching crossings, curves, narrow places in the drifts or crosscuts, or points where men are known to be working on or near the track.

(8) Motormen should promptly report to the electrician, mining captain or shift boss any defective condition of electrical equipment.

(9) No one except motormen and brakemen should ride on a motor or cars, without special permission from the superintendent or captain.

(10) Men not employed as motormen or switchmen should not couple cars, throw switches or alter the lineup of switches.

(11) Trammers, or other employees, should not leave cars at or near switches or crossings, in such a position that they will not clear motors or cars moving on another track.

(12) When cars are pushed from where they have been filled to a point where they can be handled by the motors, the trammers should notify the crew of the motor either by remaining near the cars or by placing lighted candles on them. The same rule should be followed in the case of timber trucks or other equipment left standing on the tracks where motors are liable to approach from either direction.

*From Inland Steel Co.'s book of rules.

(13) Men having occasion to work on motor-car tracks should protect themselves by placing blue lights on the track.

(14) Do not place any strain on mine timbers when replacing cars on track.

(15) Do not carry high explosives on electrically operated cars.

(16) Brakemen should always carry lanterns.

(17) Brakemen should not ride on the front end of cars except in case of urgent necessity.

(18) Operators and brakemen should exercise great care not to get caught between cars and timbers. When riding, do not stick your feet out at the side of the car, as you are apt to do if in a kneeling position.

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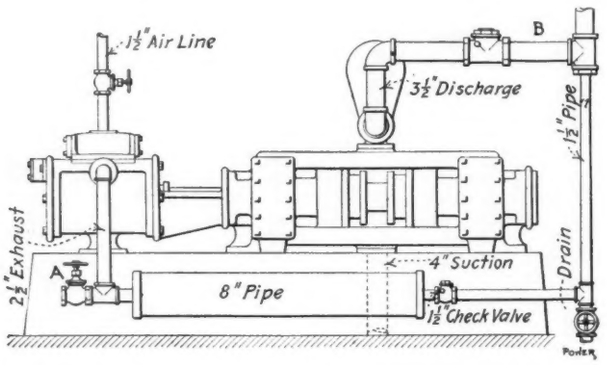
Combination Pump and Air Lift

An extremely ingenious method of connecting an air-actuated mine pump is described by Walter L. Houston in *Power,* April 22, 1913. The device was installed to eliminate freezing troubles in the exhaust passages. It was not practicable to reheat the air, so the connections shown in the illustrations were made. The pump was a 12 and 6x13-in. machine, working against a 400-ft. head under an air pressure of 90 lb. The exhaust was piped to a receiver made of an 8-in. by 4-ft. pipe. A connection *A* was provided for exhausting into the open if desired. The receiver was connected to the discharge *B* of the pump, and in this connection, a check valve was set to prevent the return of the water to the air-end of the pump.



PUMP EXHAUSTING INTO DISCHARGE COLUMN

The air working in the pump cylinder nonexpansively left the cylinder at approximately 90 lb. It was thus able to force its way into the pump column provided this was not filled to a point to produce a head greater than 90 lb. Once mixed with the water, the air acted like an air lift, forming a mixture in the pump column much lighter than water, expanding in its upward course and assisting in raising the water. With the proportions of the air end, the water end and the lift here given, there could be no further possibility of the air not being able to exhaust against the pressure in the discharge column.

The freezing difficulty was effectually overcome, but the idea would seem to be capable of more important development. A mine pump with cylinder ratios designed for a certain lift could have its possible lift thus increased, something often desirable where sinking pumps must be adopted for station work. Furthermore, a permanent installation could be designed with the ratio of the cylinder diameters so adjusted to the lift and quantity of water to be handled, that the air should be exhausted at the discharge end of the pump column at atmospheric pressure and be made to do all the work possible, thus utilizing all the potential energy in the compressed air.

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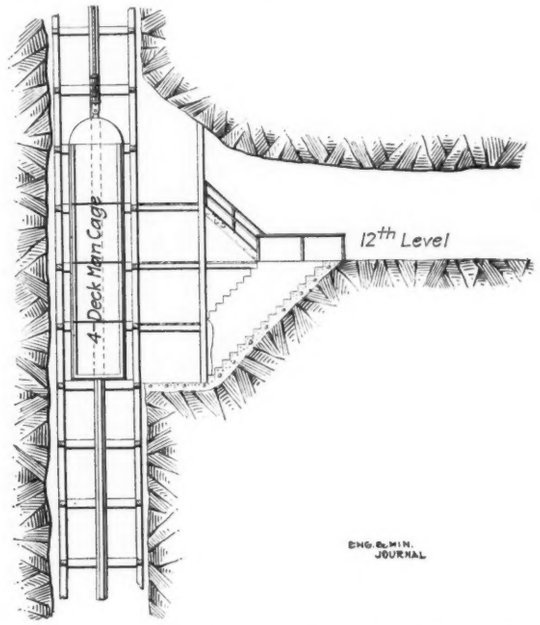
Simultaneous Loading on Four-Deck Man Cage

The accompanying sketch from an article by R. C. Warriner ("Journ. South African Inst. of Eng.," April, 1913), illustrates the method used underground to load the men on the four-deck cages of the No. 5 shaft of the Crown Mines, Ltd. A similar arrangement is in use at the surface. The cages carry 20 men per deck and have doors of the rolling shutter pattern, which allow a full width opening, and facilitate loading and discharging the men. It takes 1¾ hr. to raise the shift of 3200 men with two cages run in balance by an electric hoist.



UNDERGROUND STATION FOR FOUR-DECK MAN CAGE

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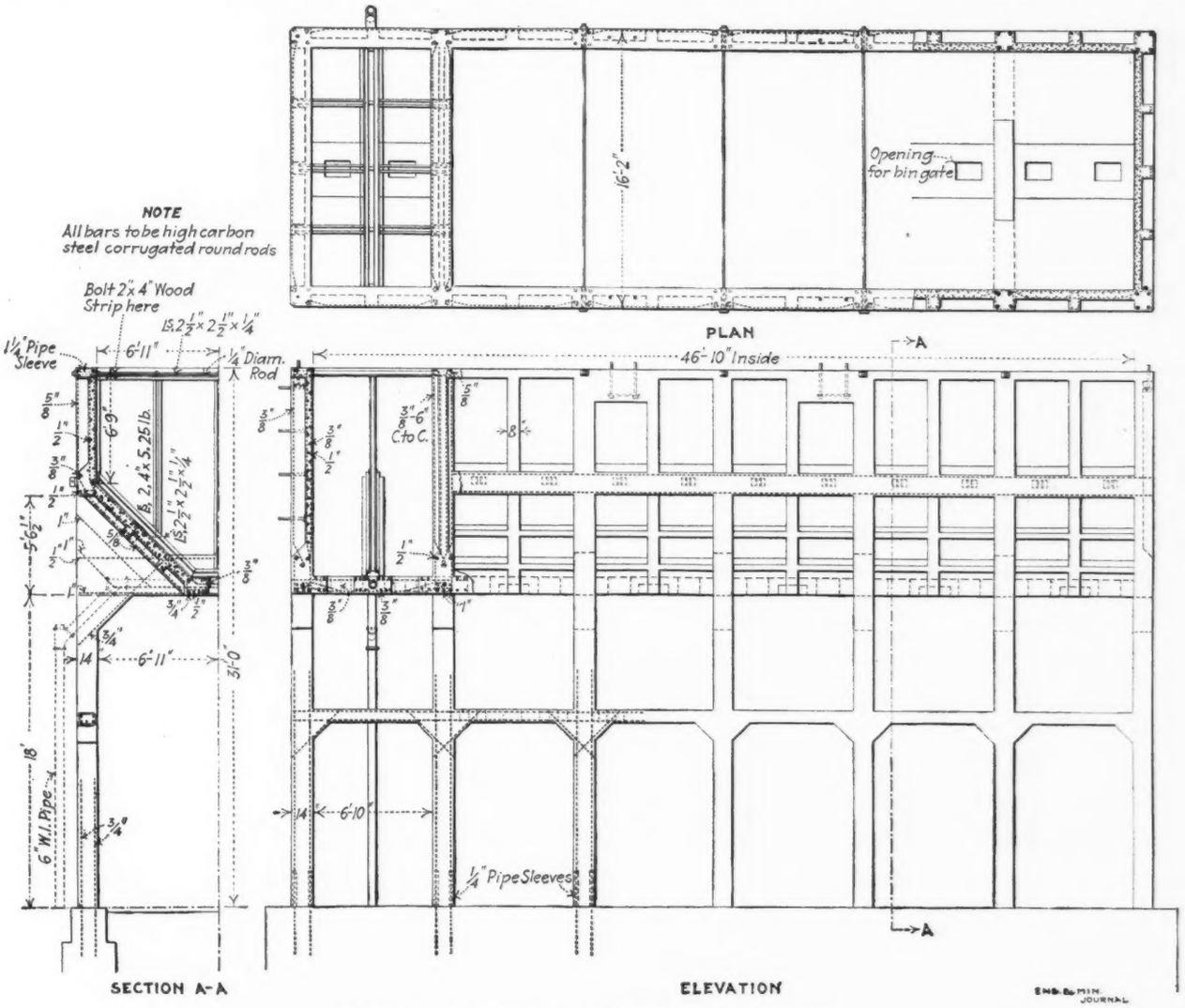
Steel vs. Wood Guides

For two rectangular shafts sunk by the Brakpan mine on the Rand, Wood's slotted steel guides were installed. The considerations governing their selection as given by Charles B. Brodigan (Sir Clement Le Neve Foster Memorial Lecture) are: (1) They provide a smoother running way for the skips; (2) they strengthen the whole shaft, due to the long length of steel which ties the timber set together; (3) accidents from broken guides are entirely prevented; (4) the expense of upkeep is less than when wood is used, and interruptions to hoisting are fewer. These guides are much more expensive than wooden guides, adding about $1.25 per ft. per guide to the sinking costs. They have not been found satisfactory in all cases, and clearly would not do if acid water were

encountered. Apparently their advantages would increase with the depth of shaft, as they permit the highest possible hoisting speeds, and also with the life of the mine, as a long life would allow their high first cost to be returned.

Reinforced-Concrete Tailings Bin

In the accompanying drawings are shown the details of the design of a reinforced-concrete bin for receiving tailings prior to loading them into railroad cars. Such a tailings bin is in use at the Leadwood mill of the St. Joseph Lead Co., while another has been erected at No. 3 mill of the Doe Run Lead Co., near Rivermines, Mo. At present the bins are used only when tailings are required for ballast on the railroad.



TAILINGS BIN BUILT OF REINFORCED CONCRETE

These bins were made out of a concrete mixture of one part portland cement, two parts sand, and four parts of coarse mill tailings approximately 9 mm. in size. These components were mixed with water to a thick batter. The reinforcement is "corrugated bar," a product made by the Corrugated Bar Co., of St. Louis, Mo. The accompanying drawings show the manner of putting in this reinforcement, which was arranged with interlocking hooks in a somewhat complicated manner, making it difficult to set in its proper position in the forms, and to hold it there while the concrete was being tamped. In all probability the arrangement of the reinforcement would be considerably simplified in case another bin were to be erected.

The bars were tied in position in the forms by No. 10, soft, annealed wire, and with the exception of the stirrup pieces, the different bars were wired together with No. 16 soft, annealed wire, where they intersected one another. All the bars larger than ⅜ in. were bent to shape at the factory, while the smaller reinforcement was bent to the proper shape as it was put in place. The vertical posts, as well as the crossbeams that reinforce the hopper bottom of the bin, were strengthened by wrapping the main rods with ¼-in. plain rodding as straps to tie the main rods together. This rodding is tied around only one of the bars in each loop of the spiral, but as in the next loop it is tied around the next main rod of that member, all the vertical rods are firmly bound in their proper positions according to a regular plan. The rods of the posts were spliced to the rods of the foundations by means of pipe sleeves, while the tie rods at the top of the bin also pass through

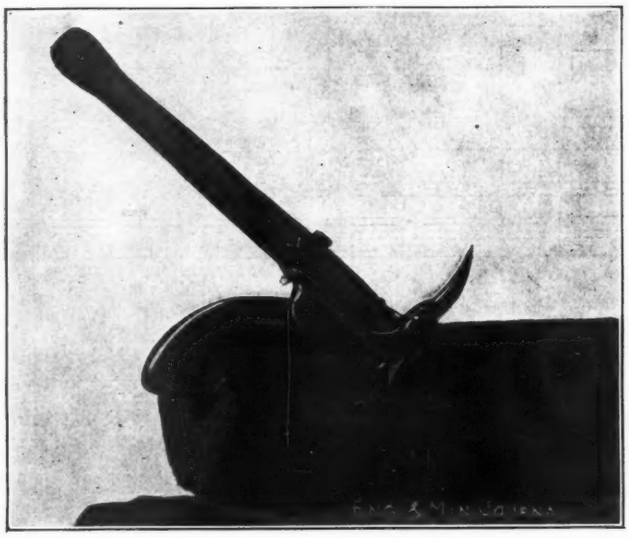
pipe sleeves, placed in position when the concrete was being poured.

The bin is divided into two parts. One is for the coarse tailings such as are delivered by the dewatering wheels, while the other is for the fine sand that overflows from the tanks of the wheels. The fine tailings are pumped, while a belt conveyor is used to carry the coarse tailings to the bin. The compartment for the fine tailings is divided in half by a longitudinal partition near the bottom that carries a screen. This holds back all but the finest of the tailings, and the water drains off before the fine tailings are loaded into the railroad cars for their final disposal. The filtering diaphragm is built up of channels, angles and Z-bars. The bin is served by bottom-opening doors operated by a screw on the end of the axle of a wheel driven by a rope loop so that it can be whirled rapidly.

The bin was designed by H. R. Wahl under the supervision of O. M. Bilharz, the general manager of the Doe Run Lead Co., and is, I believe, the first bin designed for the disposal of coarse and fine tailings by means of railroad cars.

Handy Timber and Box Hook

The accompanying illustration shows a timber hook, especially intended for use around plants for treating railroad ties (U. S. pat. No. 1,065,468). The tool is apparently extremely handy, and embodies some simple but new points in devices of this nature. It will be noticed that the swinging hook terminates in two points, and that the toe ring on the handle has two similar spurs. The effect of this arrangement is to give a nonswiveling hold on a timber, box or barrel, or anything which it is intended to lift. A corner hold can also be had from left or right, and an end-lifting hold for carrying and piling. On the handle, at a point opposite the spurs, is situated a lug hook for use on poles. The special applications of this tool will be in handling short timbers around the framing shed, in timber-preserving plants, at the shaft collar or shaft stations underground, and also for handling heavy boxes of castings, hardware, etc. The tool illustrated is 18 in. long, a size adopted for standard ties; two larger sizes are contemplated for use on mine timber and on carriages in sawmills. The device is for sale by the Eureka Tie & Timber Hook Co., Helena, Montana.

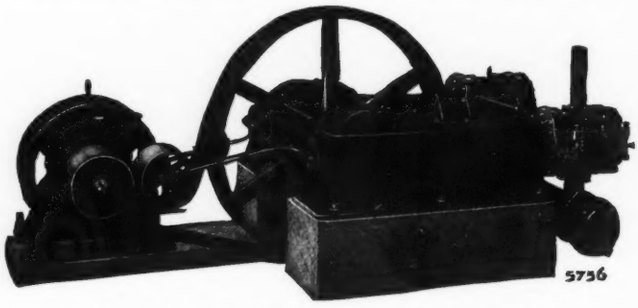


Two-Pronged Cant Hook

Short Belt Drive for Compressor

It may happen in installing a belt-driven compressor that limited floor space prevents the use of a sufficiently long belt, if ordinary drive is used. An ordinary belt drive on short centers gives too small an arc of contact between the belt and the pulleys to provide sufficient grip and driving power. The trouble is only aggravated by increasing the belt tension, since this increases the friction losses and crossing a belt causes friction, wear and uneven stretching.

The device illustrated is designed to permit the use of an extremely loose belt on short centers and thus increase the arc of contact without permitting slippage. The lower side of the belt is made the tension side and the floating idler is swung from the compressor frame itself by means of two arms. If the load increases, the tension in the tight side of the belt increases, the length of the slack side increases, the idler drops somewhat, and automatically extends the contact arch to take care of the greater power demands. The device is put on the market by the Ingersoll-Rand Co., and is said to combine economy, simplicity and reliability.



Air Compressor Rigged for Short Belt

Slip Joint Siphons

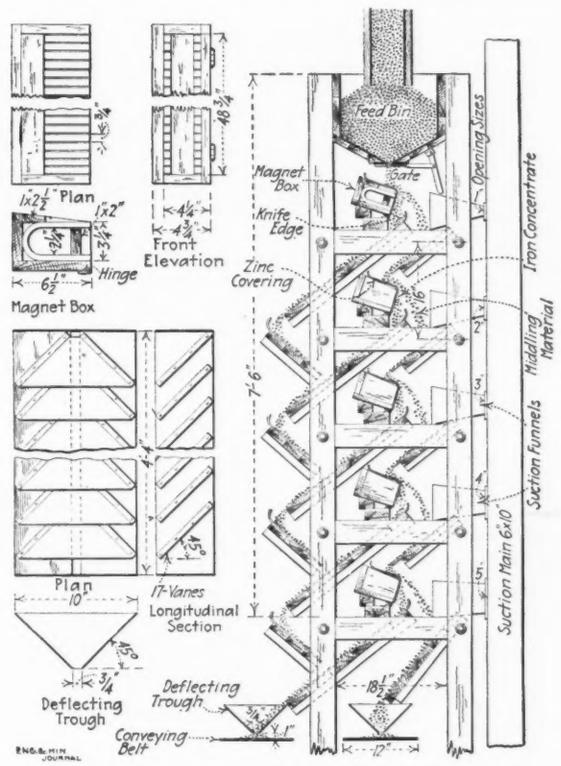
In taking the water systems of the Seward Peninsula across gulches, siphons are frequently employed, as in other regions. Riveted steel and wood-stave pipes have been used, but in most of the siphons slip-joints are made (Water Supply Paper, No. 314, U. S. Geol. Surv.). In making such joints, the pipe, the end of which is of larger diameter is heated by placing burlap dipped in kerosene around it, and igniting. The pipes are driven together by means of a heavy ram directed against a driving plate covering the opposite end of the pipe. The ram is handled by two men, or if the pipe is large is swung from a tripod. The joints are driven to give a lap of 4 to 6 in., depending on the size of the pipe. The method is cheaper and more rapid than riveting, although a certain amount of pipe length is wasted. In long lines, expansion and contraction due to changes in temperature, may cause heating and break some of the joints. This difficulty can be minimized by keeping the pipes full of water and protected with sod or earth. In cases where two sections pull apart, a lead joint is necessary in repairing.

DETAILS OF METALLURGICAL PRACTICE

Home-Made Magnetic Concentrator

By L. O. Kellogg

In an article published in the Journal of Aug. 9, 1913, mention was made of a magnetic concentrator installed at the property of the Mount Summit Ore Corporation and a brief description of the device was given. I present it here in more detail. The ore flows vertically from the bottom of a bin into a box extending over the top of the concentrator unit. The box is lined with sheet iron and its bottom has sloping sides. The edge formed in the center of the bottom is cut back to



Iron Concentrator, Using Fixed Permanent Magnets

give a flat surface 5 in. wide, and a ⅛-in. iron plate with a ½-in. slot along the center is fastened to it. Another plate sliding across the bottom of this from the side, and actuated by a lever, acts as a gate. The dry ore, crushed to ⅛ in., falling in a stream through this slot, hits the top of the first box of magnets and slides over the edge, as shown. This box of magnets is shown in detail. The magnets are of the type used in small magneto machines. They are set together, 61 in a box, in the manner illustrated, and are covered with sheet zinc on the top and bottom.

The falling ore, slipping over the edge of the box, is given a certain amount of outward motion. Some of the magnetic particles are held in toward the magnets, fall on the left side of the knife edge, and slide down the inclined shelf. The knife edge and the shelf cover are of zinc sheet. The falling concentrate is caught on another shelf sloping in the reverse direction and brought to a third shelf which is carrying the concentrate from the second magnet box, and so on down.

The discard from the first box, falling to the right of the knife edge, lands on a zinc-covered shelf sloping to the left, and is conveyed to the top of the second box of magnets, where operations are repeated. Thus the ore is subjected to the influence of the magnet five times, it being desired to take out a small portion of clean concentrate each time. The final combined concentrated product of the five boxes slides down the last shelf to a galvanized-iron V-shaped trough which is placed 1 in. above a conveyor belt. The trough is also illustrated in detail.

It contains 17 deflecting vanes, which turn the direction of flow of the sliding ore at right angles and discharge it on the center of the belt through a ¾-in. slot. The vanes are so placed that the top of each overlaps the bottom of the preceding one. The tendency of the concentrate to overload one side of the belt or to spill, is overcome by this device.

Behind each box is a rectangular funnel of galvanized iron connected to a vertical suction pipe. Its function is to catch the dust and draw it out of the falling stream. The size of the opening of this funnel increases from 1x8 in. for the top box to 5x8 in. for the bottom box, in order to compensate for a loss of suction in the lower boxes.

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Settling Slime with Glue

The rapid settling of fine slimy material resulting from crushing ores has presented obstacles which have been encountered by most metallurgists, but whose overcoming has never been remarkably successful. It is claimed that the fine material which thus escapes in crushing and concentrating plants carries a large part of the value of the ore with it, and is opposed to successful recovering of the contained mineral.

A. G. French, of British Columbia, under U. S. Patent No. 1,065,678, proposes a method for rapidly settling all this material. The method consists simply in adding gelatin or glue to the pulp at the points where the material is delivered into settling tanks or tailing-recovery tanks, a very weak solution of gelatin or common glue, in the proportion of about one part of ordinary glue in 250 parts of water being used. One part of sulphate of zinc, iron, copper, or any other metallic sulphate is to be added where sulphates do not already exist in the ore.

The principle of the treatment lies in the fact that each particle becomes coated with an exceedingly thin film of a colloid substance consisting of an insoluble combination of the metallic salt and the gelatin.

The particles so coated lose their affinity for water and sink rapidly to the bottom of the containing vessel. It is said that the time required to effect complete settlement in a tank containing six tons of effluent will not exceed five minutes.

❋

Laboratory Sintering Apparatus

An appliance suitable for conducting sintering experiments in the laboratory is described by H. B. Pulsifier, in the *Chemical Engineer,* April, 1913. It comprises a small cast-iron roasting pot or pan, a fan and a motor

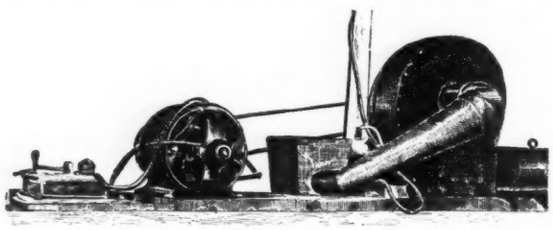

FIG. 1. ARRANGEMENT OF SINTERING APPARATUS

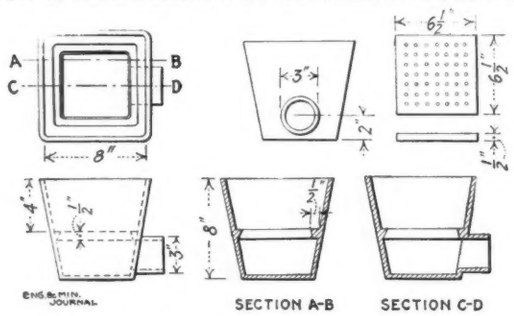

FIG. 2. DETAILS OF SINTERING PAN

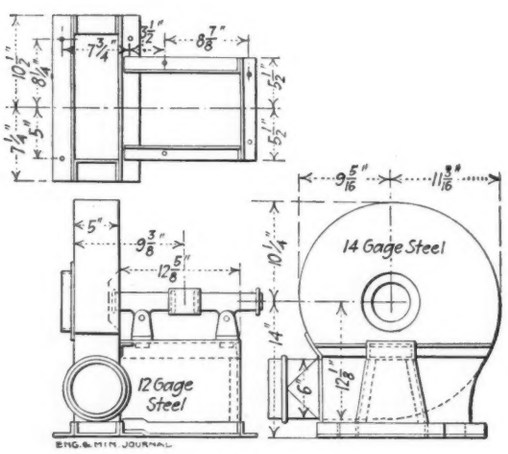

FIG. 3. DETAILS OF EXHAUST FAN

to drive it, connected as shown in Fig. 1. A suction gage is connected to the pan bottom and shows the amount of suction in inches of water. The drawings in Fig. 2 show the pan-construction details and Fig. 3 the construction of the exhaust fan.

In sintering a good deal depends upon the proportions of the mixture, such items as fuel, moisture, etc., requiring close attention, but most important of all is the manner of placing the prepared charge in the sintering pot. It is essential that it shall have been thoroughly mixed and is entirely homogeneous, and laid in an evenly porous bed of the same thickness at all points. Ignition may be by excelsior broken and spread over the surface of the charge, or in the same way by using sawdust, igniting in each case with a match. An oil burner which will spread the flame over the surface of the charge is better than either excelsior or sawdust.

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New Merrill Method of Precipitation

A new idea in the precipitation of gold and silver from cyanide solutions has been devised by Charles W. Merrill, of Berkeley, Calif., for which he has been granted U. S. Patents Nos. 1,063,568-69-70. The idea has occurred to Mr. Merrill that both zinc shavings and zinc dust are accompanied by disadvantages and expenses inseparable from their manufacture and transportation which it would be desirable to overcome. The ideal striven for is to manufacture and use the precipitant in the quantity required and at the same time. This result has not been heretofore accomplished, but the system proposed by Mr. Merrill seems feasible. The process covered in the patents above mentioned makes use of a small tube mill through which the pregnant solution is drawn without previously having received any precipitant, but which is made and furnished inside the mill itself. The precipitant is to be furnished by using pebbles, or balls, inside the tube mill, made of zinc or an alloy of zinc and some other metal which will precipitate the precious metals from cyanide solutions. The lining of the tube mill may be made of the same zinc or alloy or may be of an abrasive material, such as carborundum.

Metallic zinc, in a pure state, or when alloyed with small quantities of lead, is so malleable that it will not readily grind in such a device as this tube mill, and for this reason the pebbles, or balls, which furnish the precipitant, are to be made of zinc alloyed with some material or metal which will make the combination extremely brittle and easy to grind. In practice such an alloy may be composed of zinc, lead, magnesium, aluminum or some similar combination of metals. In order to make this material more easily ground, abrasives, such as carborundum, quartz or other form of silica, may be mixed in with the metal alloy at the time it is being made.

The solution, after passing through this grinding apparatus and receiving its charge of precipitant, is pumped to a filter press which removes both the precipitant and the precipitate, and, if necessary, precipitation is continued by the more or less pregnant solution passing through the unused precipitant retained in the press. The whole arrangement is simple and it is probable that the method may hold some advantages.

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Sieves and Sieve Cloth will be tested by the U. S. Bureau of Standards, Washington, D. C., according to information appearing in Circular No. 39 of the Bureau. The fees for this work are graded as follows:

(a) Test and certification of any sieve conforming to the specifications of the Bureau of Standards	$2.00
(b) Test and report on any sieve which is rejected for mesh outside the tolerances	1.00
(c) Test and report on any sieve which passes specifications as to mesh, but is rejected for average diameter of wires	2.00
(d) Test and report on any sieve not conforming to other parts of the specifications or purchased on any other specifications	2.00
(e) Test and report on the mesh of warp wires of a piece of sieve cloth, per lin.ft.	0.60
(f) Test and report on the mesh of shoot wires of a piece of sieve cloth, per lin.ft.	0.60
(g) Determination of the average diameter of a number of wires in each direction in a piece of sieve cloth	1.00
(h) A discount of 10% on the fees above under (a) to (d), inclusive, will be allowed when sieves are submitted in lots of five or more at a time.	

THE ASSAYER AND CHEMIST

Bone Ash vs. Cement Cupels

By Donald M. Liddell*

The wish to be rid of the bone-ash cupel is present with every assayer. Bone ash is comparatively expensive, a good quality is not always to be obtained in out-of-the-way places, when corrected assays are to be run the bone ash is difficult and costly to flux, and the bone-ash cupel is constantly shedding dust over its surroundings. Hence the constant procession of Moseses who will lead us out of the bone-ash wilderness by the cement route. For cement is inexpensive, found in every uptodate plant, more easily fluxed than bone ash, and is more coherent.

Elaborate experiments were run by Holt and Christensen (Eng. and Min. Journ., Sept. 17, 1910) who decided that the loss in cupelation with cement cupels differed only immaterially from that with bone ash, and by Benner and Hartmann (*Journ. Ind. and Eng. Chem.*, November, 1911) who got over 1% higher loss in cement than in bone ash. However, as I have before pointed out ("The Mineral Industry," Vol. XX, p. 891) their results showed excessive losses even on bone-ash cupels, and it is doubtful whether their results were obtained under commercial conditions.

From recent personal correspondence it appears that other assayers are going over the same ground, and I wish to point out what I briefly hinted at in a short Journal contribution in 1910, which has been confirmed by later experiment, that to weigh fine silver out, run an assay on it, and weigh up the silver recovered is not enough.

If the purity of the recovered lead be tested the assayer may find that all that glitters is not silver. In my own experience I have found my apparent losses on cement cupels less than on bone ash, but that the actual silver recovery was practically identical, that is, the cement-cupel buttons carried more impurity (lead and bismuth) than did the bone-ash cupel buttons. When corrections were run, the entire amount of silver recovered was found to exceed 100% of the silver taken plus the test-lead correction. This is a serious matter, particularly when corrected assays are run, as is done in much copper-refinery work.

It would then appear, although like all work based on one man's experience, these conclusions may be subject to vital correction from other Journal readers, that anyone experimenting with cement cupels would do well to test the purity of his assay beads from time to time, and to run correction assays occasionally.

It would also appear that the line of least resistance would be to experiment with mixtures of cement and bone ash (as did Bannister and Stanley, Eng. and Min. Journ., Dec. 11, 1909) or perhaps cement with magnesite, or with magnesite and bone ash. On this point it is hoped that some results will be communicated to this department.

*Associate editor, "Engineering and Mining Journal."

Strontium Compounds in Blende

Attention is drawn to the presence of strontium compounds (from 0.05 to 0.8% SrO) in certain blendes, by E. Beyne ("Bull. Soc. Chim. Belg.," p. 159, 1913), and it is pointed out that this, if not taken into consideration, may lead to injustice in cases where contracts for roasted blendes are based on the difference between the total sulphur and the so called fixed sulphur (i.e., sulphur combined with lead, calcium, magnesium, and barium).

⁂

Assay of Tin Ores

Some experiments on the assay of tin ores were made by J. Caspell and J. J. Beringer, and reported in the Proceedings of the Mining, Mechanical and Metallurgical Society of Cornwall and Devon. About two grams of finely powdered tin ore were mixed with a little zinc oxide in powder and placed in a crucible, in the bottom of which was a piece of pure zinc. The crucible cover being put on, the whole was placed in a furnace heated to 1000° C. for ten minutes. The evaporation of the zinc reduces the tin oxide, leaving metallic tin.

The whole of the contents of the crucible, after allowing a minute to cool, were then put into a flask with 50 c.c. of HCl, the whole being brought to boil over a bunsen flame, and allowed to boil gently for five minutes. This transforms the tin into stannous chloride. A small nickel coil is then stirred in the boiling solution to insure that no portion of the test remains as stannic chloride. Great care has to be taken to prevent the admission of air to the flask during the period of cooling, for which reason it is attached by a rubber tube to a reservoir of carbonic-acid gas.

The final determination is by iodine titration, previously poured in the main solution. One cubic centimeter iodine solution equals 0.00503 grams tin.

Subsequent inquiries showed that certain ores required various preliminary processes—thus, mispickel ores should be previously roasted, while ores containing copper pyrite should be previously treated by acid, as should also wolfram ores.

⁂

Rapid Antimony Determinations

For the determination of antimony in antimony glance, according to H. Nissenson, 1 gram is dissolved in concentrated hydrochloric acid, the hydrogen sulphide is expelled, and, after diluting, the boiling solution is titrated with N/10 potassium bromate, indigo being added shortly before the end of the titration (*Zeit. anorg. Chem.*, p. 46, 1913), a determination is complete in about an hour and a half. The indigo solution is prepared by treating 1 gram of finely ground indigo with 6 c.c. of cold concentrated sulphuric acid, and, after two to three days, adding 100 c.c. of water and pouring off the clear

solution. The electrolytic method is rapidly carried out by dissolving 0.5 gram of substance in caustic soda, adding 80 c.c. of a cold saturated solution of sodium sulphide, heating to boiling, filtering into a tared platinum dish, and electrolyzing with a current $ND_{100}=1.5$ amp. Under these conditions, the deposition requires about 75 min., and 1% must be deducted from the weight found (compare Foerster and Wolf, *Jour. Soc. Chem. Ind.*, p. 644, 1907).

With oxide ores and slags, in absence of arsenic, 1 gram is heated for about 10 min. with 6 grams of sodium peroxide, the mass is extracted with water, and the solution acidified with hydrochloric acid and evaporated to dryness; silica is filtered off, the filtrate saturated with hydrogen sulphide, the precipitated antimony sulphide dissolved in concentrated hydrochloric acid, and the boiling solution titrated with potassium bromate. In presence of arsenic, the sulphide precipitate is boiled for a long time with water and, after filtering, the solution containing the arsenic is acidified with hydrochloric acid and titrated boiling with potassium bromate, the antimony sulphide being dissolved in hydrochloric acid and similarly titrated. Decomposition with sodium peroxide may also be effected in the presence of arsenic by dissolving the melt in concentrated hydrochloric acid and precipitating the arsenic with hydrogen sulphide; the mixture is filtered through asbestos, the residue washed with hydrochloric acid, dissolved by boiling with water, the solution acidified with hydrochloric acid, boiled, and titrated with bromate. Antimony is precipitated as sulphide from the diluted filtrate, and the precipitate dissolved in hydrochloric acid and titrated as before.

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Law of Volatility in Chemical Reactions

In a recent issue of *Comptes rendus*, p. 1536, 1913, C. Matignon generalizes Berthollet's "law of volatility" in the following form. "Every system of liquid or solid bodies, which is capable of giving rise to a system containing volatile substances, will undergo reaction in that sense at a convenient temperature." The reaction $2\,Al + 3\,MgO = 3\,Mg + Al_2O_3$ is possible because magnesium is quite volatile at comparatively low temperatures. In the same way it is probable that baryta will be reduced by silicon, owing to the relative volatility of the barium produced. The law can also be extended as follows: A reaction which has volatile bodies in its initial stage and also in its final stage, is facilitated when the number of volatile molecules in the final stage is greater than that in the initial one, i.e., of two reactions which are equally endothermic, the one complying with this condition will proceed at a lower temperature.

❋

Determination of Asphalt in Oils

The proportion of asphalt contained in asphaltic oils of California, Texas and Oklahoma varies within wide limits. This is largely due to great variations in the asphaltic oils themselves, but there are also deplorable differences in the method of determining the asphalt in crude petroleum. Asphalt in an oil may be determined in either of three ways: First, by Holde's method, which consists of distilling off the light oils which may exist in the crude oil and then shaking the residue with 40 times its volume of gasoline, boiling between 65° C. and 95° C., and as free as possible from unsaturated hydrocarbons; it is then allowed to stand for 24 hr. and is filtered. By this means the solid asphalt in the oil is obtained upon the filter, together with the clay and other mineral impurities contained in the oil. The asphalt is dissolved by washing with benzol. The benzol is evaporated in a weighed porcelain dish and the weight of the asphalt obtained. There is usually considerable liquid asphalt present in the oil which is not separated by this means, therefore another method is often employed, which gives the total asphalt, hard and soft. This is called the ether-alcohol method. It is well described by Dr. Albert Sommer as follows: "Ether-alcohol precipitates not only asphaltenes, but also the softer components of asphalt, and is, therefore, used especially to determine the total amount of asphaltic matter in crude oils, etc. This method can also be well adapted for the determination in fluxes and harder bitumen. The procedure is as follows: 2 grams of the asphalt are weighed into a 100cc. graduated cylinder with a well-fitting glass stopper and 40 c.c. of a mixture of alcohol-ether consisting of four parts alcohol and three parts ether, poured into the same cylinder, which should then be attached to a shaking device and shaken well for about 20 minutes. After this time it should be left to stand overnight, and should be filtered in the same manner as described with petroleum ether, only the same mixture of alcohol-ether should be used until all the soluble parts are removed from the precipitate. Benzol is then used in the same manner as above described, and the weighing and calculation made in the same manner as with the asphaltenes. In the case of oils which are rich in paraffin this method sometimes precipitates part of the latter also, therefore the precipitate of such oils is repeatedly extracted with hot alcohol."

The third method of determination of asphalt is by evaporation, also described by Dr. Sommer, as follows: "A certain quantity of asphalt is evaporated in a dish of certain dimensions at a certain temperature. The loss is taken and the consistency of the residuum determined by the usual methods, such as penetration, *i.e.*, the number of tenths of millimeters which a needle weighted with 100 grams penetrates into the asphalt at 25° C. Ten millimeters of '100 penetration' is usually the chosen standard and the percentage of remainder of that consistency is usually called the asphaltic contents."

The oils of the Coalinga district in California have been analyzed by I. C. Allen, now petroleum chemist of the Bureau of Mines, in "Bulletin" No. 398, U. S. Geological Survey. Samples were studied from 83 wells. The method of determining the asphalt is different from that used by either Holde or Sommer. The crude oil was distilled to 250° C. at atmospheric pressure and the distillation was then continued under a vacuum of about 40 in. of mercury "to a temperature to 330 to 350° C.," that is, until practically all liquid is over and only a hard brittle mass of asphaltum remains when cooled.

By this means Coalinga oils were found to vary in asphalt contents from a minimum of 1.89% to 57.42%. The average for this series is 26.5%. These methods of analysis were published in a pamphlet on the "Production of Asphalt, Related Bitumens and Bituminous Rock," by David C. Day, issued by the U. S. Geological Survey.

Notes On Lake Superior Copper Mines

Special Correspondence

SYNOPSIS—A résumé of recent developments at some of the Lake Superior copper mines immediately prior to the strike.

Until the general strike of the miners of the copper country was declared, July 23, the Superior copper mine had been making a record for efficiency and for earnings that had come pretty well up to the expectations of the management. Underground operations had been confined to drifting and stoping, with the result that the property was reaping the reward for the extended openings which had been made in a period covering two years when developments underground were carried on at a scale which did not show much actual copper output, but which meant a great deal in assurance for the future.

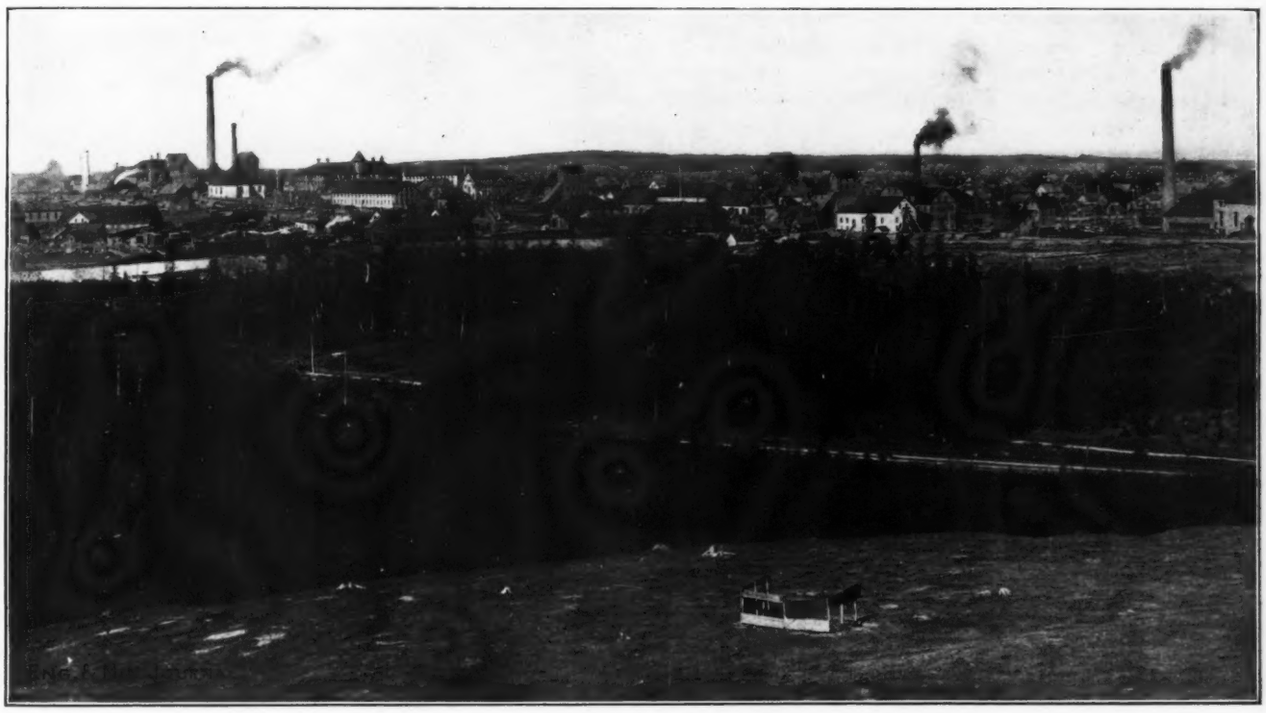
Immediately prior to June 23 there had been no sinking under way at the property, and all efforts had been directed toward getting out rock. The maintenance of rock shipments to the Points Mills plant continued up to expectations, and the copper content showed itself equal to the best coming from any of the amygdaloid mines of this section, possibly excepting the Champion and the Ahmeek.

There had been no new developments at the Indiana mine, and the work at the bottom of the shaft had not located the rich No. 2 lode, which was originally opened by the drill cores. At the 600-ft. and at 1150-ft. levels, the showing of copper was good in every respect, and more and more copper ground continued to be opened with each blast. Plans had been made for further shipments of the mass copper taken out at these two places.

Allouez has been in position to increase its output and to maintain the same high grade of rock that had been characterizing its shipments up to the time of the strike. This property had been making substantial earnings, and was in position to announce its first dividend in the near future.

Hancock Nearly Ready to Produce

The Hancock was about to become a substantial shipper and producer of copper ore. It had been hoisting an average of 150 tons daily. Shipments to the Points Mills plant had, however, been made intermittently after 50 cars accumulated on the siding. This arrangement was necessary by reason of the fact that the rock had been milled at the customs rate, and there had to be a clean-up before and after each lot of Hancock rock was treated.



The Calumet & Hecla Plant from the West

While no figures are obtainable from the management as to the quality of this rock, and while the shipments have not been considered in the nature of a test of the general run of the mining, it has been stated that the rock has been running better than 20 lb. mineral per ton. This rock has been coming from various openings, and has been taken out in the extension of drifts, preparatory to larger and more regular shipments. As a matter of fact, the Hancock could have pushed its shipments up substantially had not the impending labor trouble already foreshadowed some embarrassment. The mine had plenty of miners, but was short of rock pickers, sorters, trammers and common laborers. Up to this time it had not been troubled by scarcity of labor, because of the fact that it is situated in the city of Hancock. The mine had 80 shipping points underground, and it would have been

an easy matter to maintain daily rock shipments of close to 1000 tons. It is interesting in this connection to note that the lower level openings on the Pewabic lode are showing many of the characteristics of the Pewabic formation on the Quincy. The main lode now is paralleled by quite a number of smaller lodes not far from the main lode, which are narrow but rich in mass copper, and with plenty of average stamp rock.

Hancock and Quincy Not to Consolidate

In some of the openings, two and even three of these branch lodes run along with the main formation. In the lower openings of the Quincy this condition is becoming more and more pronounced and a more important factor in developments. In fact the branch lodes are now looked upon as fully as important as the main lode. At different times since the organization of the Hancock Consolidated and the commencement of operations, there have been stories to the effect that the Hancock and the Quincy properties eventually would be consolidated into one corporation and managed as one company. That the move would admit of opportunity for economies in operation goes without saying. At the same time all the stories that have been in circulation at different times in the past have proved without foundation. Recently there has been a revival of the rumor. President John D. Cuddihy, of the Hancock Consolidated, when asked regarding this statement, said that there was no truth to the story.

Grand Portage Lode at Isle Royale

The development of the Grand Portage lode at the Isle Royale property continued to be encouraging. This formation first was tapped by long laterals from No. 2 shaft. The character of the ground, from the first, was good and as it was developed it improved. For several months the Grand Portage formation had been regularly furnishing the Isle Royale with a good quantity of stamp rock. In the early days of the old Huron mine this lode was one of the most prolific sources of rich-rock supply. It was, at all times, an eccentric formation; narrow patches of rich ground would alternate with wide stretches of poor rock. Strange though it may seem, in all the later-day openings, the showings have been quite a little above the average of the earlier showings and the grade of rock has been better than the average of the Isle Royale lode.

What was of greater importance was the fact that the explorations had been so extended that the management was considering plans for more extended and more economical mining of this lode. Either the old No. 1 shaft was to have been cleaned and concreted and put into good condition again, or a new shaft sunk. One plan appeared about as economical as the other. No. 1 shaft had been out of commission for many years, ever since it was wrecked by fire. It is, however, well located and could be rehabilitated at a cost which might make it more economical than to start a new shaft in this vicinity. A new shaft would permit extensive openings on the Grand Portage formation.

Openings on the Pewabic Lode

The Quincy was installing a new hoist at the Mesnard or No. 8 shaft, preparatory to raising a greater part of its production through this shaft. At the lower openings of the Mesnard shaft the physical characteristics of the Pewabic lode are unusual. The lode, instead of being wide and broken, is split into two or three and in some places four different veins, each with distinct foot and hanging walls. These little veins average 4 or 5 ft. in width, but are rich in copper. A different system of mining must necessarily be applied here successfully to obtain results, because it is necessary practically to break down the vein rock and the vein rock only.

Franklin had been conducting exploratory operations to open the Allouez conglomerate at a depth of 3200 ft. A crosscut from the Pewabic lode was being driven 500 ft. to intercept the Allouez. This formation formerly was operated to good advantage on the Franklin property, but at a depth of 2300 ft. it petered out and became so thin and lean that it was considered worthless. Now it is believed that the exploration effort would be worth while at this greater depth.

Evergreen a Rich Producer of Mass Copper

The Evergreen lode always has been notable for the large amount of mass copper it contains. The Evergreen had lately been turning out more mass copper than ever before, in fact running close to one-third of the total output of the Mass Consolidated company. At the Mohawk the management was bending all energy toward higher underground efficiency in the selection of rock and in the choice of locations for further breaking down of rock. The openings tributary to No. 6 shaft, while not on a par with those of the North Ahmeek, were, nevertheless, showing a grade of rock which is decidedly better than the average of the Mohawk shafts. The construction of the new shaft rockhouse at No. 6 was nearing completion, including all of the machinery installation.

While some Allouez shareholders may have suspected that it was taking a good while to get the property into shape for dividend disbursements, it must be remembered there are one or two features of underground development work as practiced at the Allouez that are likely to have quite an influence on the future of the property which may not now be appreciated. For instance, instead of cutting down stopes right near the shafts, all laterals are driven to the shaft limits and stopes are cut down at the extreme outside drift limits first. This saves time and labor, but it effects a more important saving by the fact that comparatively little timber is needed, as stopes can be abandoned when cleaned out and no heavy pillars of rich rock need be kept standing, nor is extensive timbering necessary. To cut out a mine in this fashion requires, however, much preliminary work.

The stockpile at La Salle had been treated and underground rock was to be sent to the mill. The best stope ever opened in No. 1 shaft is at the twelfth level, where a fairly good grade of commercial rock of the Kearsarge lode has been exposed. There was every reason for the belief that the rock would show better results than those obtained the last time the La Salle shipped mill rock down. At that time the refined copper return was under 14 lb., which included all mass and barrel material.

South Lake had cut the station at the bottom of the shaft depth 500 ft. Opening the Evergreen lode at a depth of 300 ft. was in progress, the formation having been cut in the crosscut. This formation contains good copper at this point. The lode is fully 40 ft. wide and well impregnated with shot copper that looked unusually

rich when opened by the shaft on the way down. Some enthusiasts believed that this property was going to repeat the record of Ahmeek and meet expenses from the time the first shipments were made to the Franklin stamp mill. This opinion was not shared by the management, the statement having been given out that the shipment was simply for the purpose of making a test of the vein. These notes, while fragmentary to a degree, are indicative of some of the most interesting work that was going on in the copper country at the time all the mines were closed down by the strike.

The Rand Strike

JOHANNESBURG CORRESPONDENCE

The only topic is the strike. In my last letter (cf. ENG. AND MIN. JOURN., July 26, 1913), I explained how the trouble at the New Kleinfontein mine arose. For over a week the company made no effort to work its mine and on June 6 yielded on all important points and offered to reinstate all strikers if they returned to work by June 11. By this time, however, outside agitators had induced the men to demand what was practically an eight-hour "bank-to-bank" working day and they refused to return.

The company then fenced the mine, introduced free labor and started the mill. The strikers became frightened and asked to be allowed to return, but the company refused to discharge the 30 free laborers engaged, although promising to give any strikers the first vacancies or to find them work on neighboring mines. The strikers foolishly refused this offer.

The company rapidly increased its labor force and the strikers determined to spread the strike if possible; on June 19 and 20, they induced the miners of the Van Ryn Estates and the Modderfontein mines to strike in sympathy against the wishes of the majority of the men. These strikers soon became dissatisfied and threatened to go back to work if a general strike was not immediately proclaimed. The local strike leaders saw that their only chance lay in disobeying the instructions of the labor leaders in Johannesburg, who wished to call a proper ballot according to the rules of the unions, because it was well known that any ballot fairly taken would show an enormous majority against any strike. Therefore, on June 30 they gathered a crowd of several hundred strikers and marched through all the East Rand mines, "pulling out" the men by threats and shows of violence. All of this was utterly illegal and though there were enough mounted police available to have dispersed the parade, the strikers were allowed to do practically what they wished and to create an artificial strike.

The engine drivers, who are properly organized, and who have a favorable agreement with the Chamber of Mines, guaranteeing them extra-high wages, were betrayed by their officials and by a few socialistic members and were forced out in most cases also. On June 20, a proclamation was posted in Benoni, forbidding all meetings; yet the authorities on June 29 allowed a large meeting to be held in Benoni, to which miners had been invited to "come armed." Acts of violence against free laborers occurred and the police were unable to protect persons and property. All the imperial forces in South Africa were being hurried to the Rand and special constables were sworn in.

On July 4, practically all the men except staff and reduction workers had ceased work; 80% of them unwillingly, and the trade unionists of most trades were also on strike. All work except pumping and bailing on the mines was stopped and the railway men were being urged to make the strike a general one. All the men on the big power stations, even the Vereeniging, 90 miles away, had also struck. The miners and strikers declared they would hold a demonstration on Market Square and the government forbade it and lined the square with troops and police. A riot followed with some loss of life and a mob in the evening burned a portion of Park State Railway station and of the Star newspaper office and broke into shops, so that the military had again to fire on the mob.

The next day further rioting occurred in an attack on the Rand Club, and, at Benoni, shops and houses were burned. On the same day, the strike leaders were summoned to meet the government at Pretoria, and an agreement was entered into by which the men's leaders agreed to call the strike off, the Kleinfontein strikers being allowed to return on the terms offered June 6; the free laborers were to be found work by the government and the miners were to have the right to lay any other grievances before the government. A certain section of the strikers who had been led to believe that they would gain many other benefits is dissatisfied and accuse their leaders of selling them out. The great bulk of the men have, however, returned to work. Twenty-one persons have already died and there are a number of seriously wounded. Great unrest was caused among the natives of some of the mines in the Central Rand. These natives announced a strike for higher wages and had to be overawed by police and military. There are some 7000 soldiers and police on the Rand.

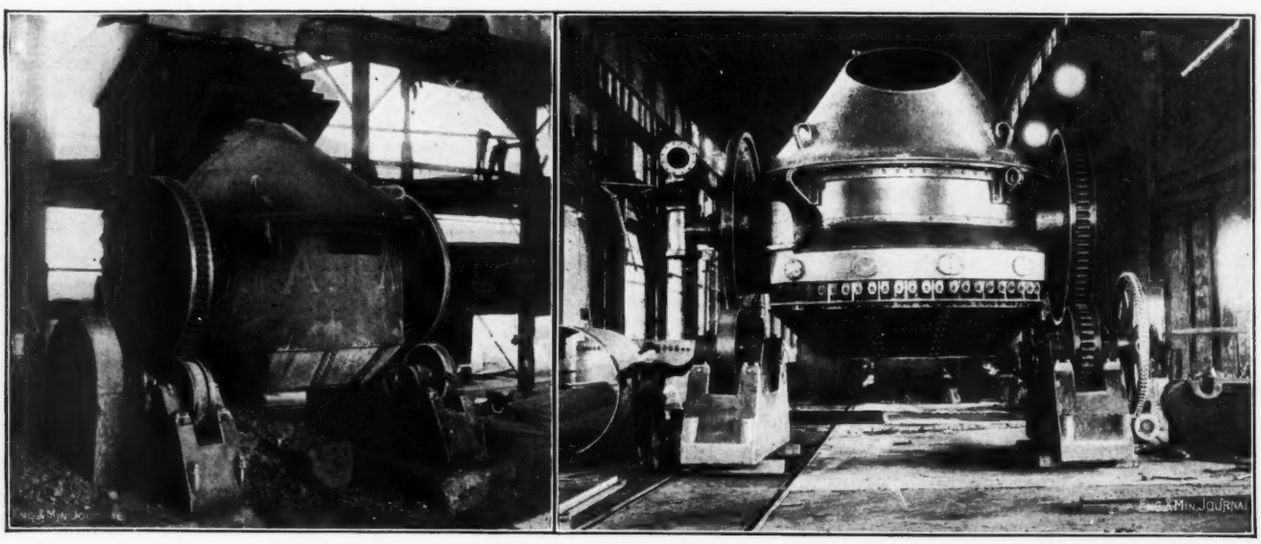
Of the results of the strike it is somewhat early to speak. The labor forces have gained enormously in solidarity. Their unions have gained recognition from the government and many nonunion workers seem to be joining the unions. They have so far gained no material benefits but are in a better position to gain them later on. The most ominous feature for the future is that they gained their ends by violence and they will be quick to adopt violent measures in future. The mining industry has received a severe setback. Confidence has been destroyed, many small investors ruined and the flow of capital so urgently required to open up new areas has been checked; the fear of future disputes over further demands of the men will hang as a pall over the share market and the business world for a long time.

The capitalists whom the strike was designed to hurt made a few millions on the stock exchange, but will find great difficulty in making further schemes attractive enough to interest European investors.

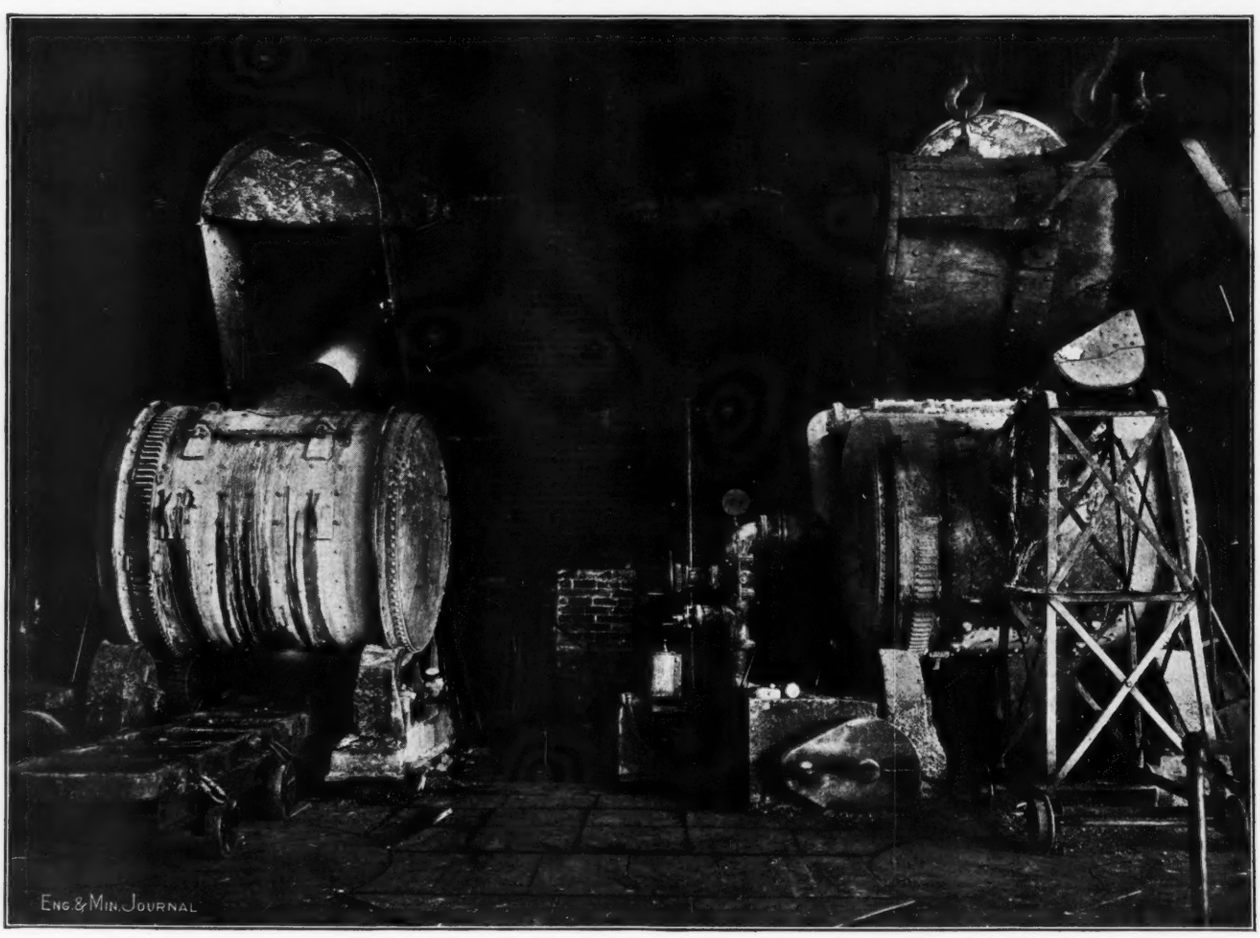
To those who believe there is too much gold coin in the world, the howl of apprehension that went up from the European financial centers when there appeared a possibility of the supply of gold from the Rand being cut off for a month or two should be instructive.

The Field of the Electric Steel Furnace is rapidly increasing, says W. Eilender, since apart from its use in the ferro-alloy industry, the electric furnace will soon not only have conquered the whole field of quality steels, but gained a strong footing as regards the production of medium qualities. In this connection Mr. Eilender showed that the cost of producing electrically-refined Thomas steel when large furnace units were used, is quite as low and even lower than that of the Siemens-Martin standard qualities.

PHOTOGRAPHS FROM THE FIELD

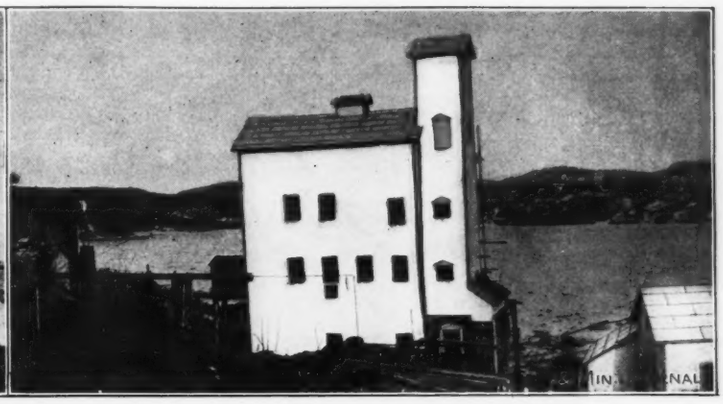


RECENTLY INSTALLED CONVERTERS AT GREENE-CANANEA SMELTING PLANT IN MEXICO
These converters are probably nowhere equaled in size except perhaps at Butte; note gear box at left pedestal.

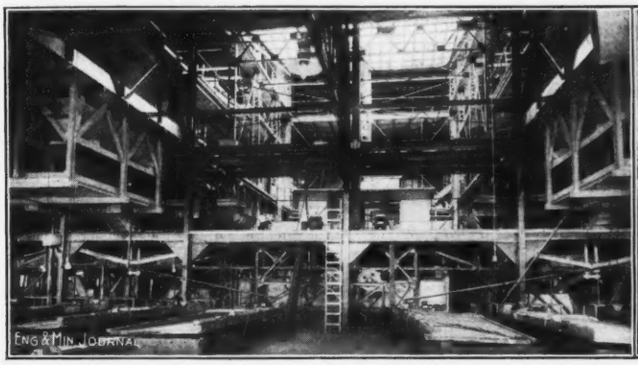


CONVERTERS AT MT. MORGAN MINE, QUEENSLAND, AUSTRALIA
The charging trough frame, encased gears and turntables in front of each stand are features of this converter installation.

MICHIGAN SHAFT HOUSE WITH CYLINDRICAL ORE BINS



SENECA-SUPERIOR MILL, PETERSEN LAKE, ONTARIO



THE DOE RUN NO. 3 MILL, IN SOUTHEASTERN MISSOURI

The picture at the left shows the crusher-feed floor; the one at the right the view through the mill, the lighting court and office on second floor being notable features of this lead-zinc ore mill.

SINKING SHAFT IN QUICKSAND, MARQUETTE, MICH.

MICHIGAN SHAFT HOUSE, WITH ROCK CRUSHER

AN EARLY-DAY REMINDER, MARQUETTE, MICH.

NEW PUBLICATIONS

THE YENTNA DISTRICT, ALASKA. By Stephen R. Capps. Pp. 79, illus. Bull. 534, U. S. Geological Survey, Washington.

THE KOYUKUK-CHANDALAR REGION, ALASKA. By A. G. Maddren. Pp. 124, illus. Bull. 532, U. S. Geological Survey, Washington, D. C.

A PRELIMINARY REPORT ON THE MINERAL SPRINGS OF GEORGIA. By S. W. McCallie, State Geologist. Pp. 190, illus. Bull. 20, Geological Survey of Georgia, Atlanta.

TESTS OF REINFORCED CONCRETE BUILDINGS UNDER LOAD. By Arthur N. Talbot and Willis A. Slater. 6x9, pp. 104, illus., paper. Bull. No. 64, University of Illinois, Urbana, Ill.

REPORT OF THE STATE GEOLOGIST ON THE MINERAL INDUSTRIES AND GEOLOGY OF VERMONT, 1911-1912. Pp. 269, illus. George H. Perkins, State Geologist, Burlington, Vt.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, VOL. V, 1912. 6x9¼, pp. 284, illus. Published by the Institute and for sale by D. Van Nostrand Co., New York.

GEOLOGY AND ORE DEPOSITS OF THE PHILIPSBURG QUADRANGLE, MONTANA. By William Harvey Emmons and Frank Cathcart Calkins. Pp. 271, illus. Professional Paper 78, U. S. Geological Survey, Washington, D. C.

MITTEILUNGEN AUS DEM EISENHUETTENMAENNISCHEN INSTITUT DER KOENIGL. TECHN. HOCHSCHULE AACHEN. VOL. V. By F. Wüst. 7½x11, pp. 160, illus., paper; 14 marks. Wilhelm Knapp, Halle a. S., Germany.

THE COASTAL PLAIN OF NORTH CAROLINA. By William Bullock Clark, Benjamin L. Miller, L. W. Stephenson, B. L. Johnson and Horatio N. Parker. Pp. 552, illus. Volume III, North Carolina Geological and Economic Survey, Chapel Hill, N. C.

EXTRACTS FROM REPORTS ON THE DISTRICT OF UNGAVA RECENTLY ADDED TO THE PROVINCE OF QUEBEC UNDER THE NAME OF THE TERRITORY OF NEW QUEBEC. Pp. 160, illus. Department of Colonization, Mines and Fisheries, Mines Branch, Quebec, Canada.

COST OF PRODUCTION OF IRON AND STEEL PRODUCTS IN THE UNITED STATES. (Full Report.) Part III of Report of the Commissioner of Corporations on the Steel Industry. By Francis Walker, Acting Commissioner. Pp. 569. May 6, 1913. Government Printing Office, Washington, D. C.

ORGANIZATION, INVESTMENT, PROFITS, AND POSITION OF UNITED STATES STEEL CORPORATION. Part I of Report of the Commissioner of Corporations on the Steel Industry. By Herbert Knox Smith, Commissioner. Pp. 422. July 1, 1911. Government Printing Office, Washington, D. C.

COST OF PRODUCTION OF IRON AND STEEL PRODUCTS IN THE UNITED STATES. (Preliminary Report.) Part II of Report of the Commissioner of Corporations on the Steel Industry. By Herbert Knox Smith, Commissioner. Pp. 144. Jan. 22, 1912. Government Printing Office, Washington, D. C.

THE THEORY OF LOADS ON PIPES IN DITCHES, AND TESTS OF CEMENT AND CLAY DRAIN TILE AND SEWER PIPE. By A. Marston and A. O. Anderson. 6x8¾, pp. 181, illus., paper. Bull. 31, Engineering Experiment Station, Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa.

RECONNAISSANCE OF THE GEOLOGY OF THE RABBIT EARS REGION, ROUTT, GRAND AND JACKSON COUNTIES, COLORADO. By F. F. Grout, P. G. Worcester and Junius Henderson. PERMIAN OR "PERMO-CARBONIFEROUS" OF THE EASTERN FOOTHILLS OF THE ROCKY MOUNTAINS IN COLORADO. By R. M. Butters. Pp. 57 plus 101, illus., Bull. 5, Parts 1 and 2, Colorado Geological Survey, Boulder.

RESUSCITATION. By Charles A. Lauffer, M.D. 4x6½, 47 pp., illus.; 50c. John Wiley & Sons, New York.

This little book, which can be read in a few minutes, and of which the essential facts cover only 10 pages, ought to be studied by every mine foreman, and the knowledge imparted to every mine worker. The prone pressure, or Schaefer, method was originally devised to resuscitate those overcome by electric shock, but the actual cause of the cessation of breathing is the same, and the method for restoring it is equally applicable, whether the asphyxiation occurs through shock, drowning, gases or fumes, anaesthetics or narcotics.

AIR COMPRESSION AND TRANSMISSION. By H. J. Thorkelson. 6¼x9¼, pp. 207, illus.; $2. McGraw-Hill Book Co., New York.

As a text for students of general engineering, this book offers the advantage of brevity and conciseness as compared with the many better known and more elaborate treatises on the same subject, to which the author acknowledges his indebtedness for most of his material. The development of the underlying theory follows the conventional lines, but the interpretation of indicator cards, as a means of correcting defects in valve adjustment, etc., is presented with unusual clarity. The chapter on effect of altitude on compressor efficiency is borrowed directly from Peele's book, and the chapter on the production of low pressure by fans and blowers is a verbatim report of an extended lecture at Columbia by H. deB. Parsons. The chapter on turbo-compressors, an uptodate feature of the book, is compiled from articles by Franz zur Nedden in "Engineering Magazine." The book is not exhaustive, but such ground as it does cover it makes clear, and will well serve its announced purpose as an introductory textbook.

COMMON MINERALS AND ROCKS, THEIR OCCURRENCE AND USES. By R. D. George, State Geologist of Colorado. Pp. 406, illus.; cloth. Colorado State Geological Survey, Boulder, Colo.

This book, issued as Bulletin 6 of the Colorado State Geological Survey, is one of the most pretentious attempts at governmental textbook publishing that has come to our notice. "The main purpose of this bulletin is to describe the commoner minerals and rocks, and furnish the means of recognizing them and knowing their uses. Many valuable geological materials lie unused for want of knowledge of what they are and how they may be used. It is hoped that it will stimulate an interest in, and a search for, valuable geological products."

We venture to predict that this laudable purpose will not be fulfilled by this volume. In the first place, its scientific terminology, its indiscriminate presentation of chemical symbols, its insistence on minute discriminations which would tax the skill of an expert, render the book unavailable for the ordinary prospector, on whom lies the burden of searching for economic minerals. Of what use is it to a Colorado prospector to know that "hardystonite is a calcium-zinc silicate $Ca_2ZnSi_2O_7$, or 2 CaO, ZnO, 2 SiO_2, occurring in a limited amount in the North Hill mine at Franklin Furnace, N. J.," or that "humite is similar to chondrodite, but contains five molecules of $MgSiO_4$ instead of three, and is orthorhombic?" On the other hand, the book will be of only superficial use to students, who are already supplied with books covering the same ground in a much more complete and scholarly manner. The author acknowledges his indebtedness to these higher authorities for practically the whole contents of his book; for this reason, there is little fault to find with matters of fact stated therein, but the whole work lacks discrimination and ought never to have been published at state expense.

DIE SCHACHTFOERDERUNG. By H. Bansen and K. Teiwes. 8x9, pp. 333, illus.; 14 marks. Julius Springer, Berlin, Germany.

This is the fourth volume of a series on "Die Bergwerksmaschinen," of which the first three have been noted in previous issues of the "Journal." This volume supplements Vol. III, on "Die Schachtsfördermaschinen," and together they cover the theory and practice of hoisting in a most thorough manner. Speaking broadly, Vol. III presented the analytical phase of the problem, while Vol. IV covers the design and construction of the appliances actually used in shafts. The examples are taken almost exclusively from German practice, and in many respects should prove most suggestive and illuminating to American engineers.

Chapter 2 describes the structure of hoisting ropes, rules for their selection, and means for cleaning, oiling, inspecting and testing. Chapter IV, on cages, is typically European, the most noteworthy feature being the multiple-deck cages for hoisting eight cars at once, and the ingenious devices for locking cars in place, and for discharging them automatically. The next chapter, on safety devices, presents numerous effective designs never seen on this side of the Atlantic, both for wooden guides and for rope guides. Amalytical methods for ascertaining the stresses produced by stopping a falling cage are presented in this long and valuable chapter. Devices for attaching ropes to cages are the subject of a separate chapter, many of which will appear novel to American readers; in general, they are more elaborate than those employed in this country. On the subject of shaft guides, the most valuable features are those relating to the methods of fastening wooden guides to the steel buntons of circular shafts. Special devices for oiling guides are illustrated. Steel rails, and wire ropes, used for guides require special methods of attachment, which are shown. A long and valuable chapter is devoted to the laying out of tracks at top and bottom of shafts, with a view to assisting the loading and unloading of cages by gravity. Hydraulic elevators and other mechanisms for facilitating the rapid unloading of multiple-deck cages are described. These, likewise, are worthy of careful scrutiny by Americans, as are also the designs for landing chairs, of many ingenious types. The final chapter, on the construction of headframes, presents a typically European practice, involving the use of steel exclusively, with a fertility and unconventionality of ideas probably never thought of, and certainly never put into practice, by American designers.

Minerals Separation vs. James M. Hyde

The suit of the Minerals Separation, Ltd., vs. James M. Hyde, was decided by Judge Bourquin, in favor of the plaintiff, as told in the JOURNAL of Aug. 2, 1913, p. 229, and Aug. 9, 1913, p. 277. Those portions of the decision bearing on the technical points will probably be of interest to the mining fraternity.

The invention claimed, in general terms, may be said to be the discovery in March, 1905, that if a very small and appropriate quantity of an oily substance, ranging around 0.02% to 0.5% of the weight of the ore be added to a pulp of water and finely pulverized ore (the slimes being helpful and most easily recovered) and the whole vigorously agitated and thereby thoroughly aërated by great and excess quantities of air, the metalliferous particles are oiled and adhere in a complete envelope to or of bubbles of the air and rise to the surface of the mixture on occasion of agitation, forming a strong coherent and stable froth easily removed. The process may be aided by heat to disseminate the oily substance more quickly and effectively through the pulp and bring it into contact with the metalliferous particles, and may also be aided by a mineral acid or salt up to 1% thereof of the weight of the ore to increase the preferential affinity of the oil for metal over gangue, but not sufficient acid to cause chemical action on the metal, nor is it intended to generate gas for flotation. The patent specification is full, complete and clear to those skilled in the art, and describes one well known apparatus of mixing vessels, spitzkasten, etc., and the operation of the process therewith.

The claims are gereral and particular, all calling for oil and agitation to produce a froth, some defining a range or quantities of oily substance, some likewise of acid, some specifying oily substances alone, some oily substances in various combinations with heat or acid and with both. The main defense of invalidity is lack of novelty and anticipation. In reference thereto it appears from the evidence that the use of oil, air and agitation in ore concentration, separately and in various combinations, and with other ingredients, was well known to the art prior to the discovery of the process in suit. To summarize fully the prior processes, some of them were bulk oil processes, using oil in such large quantities that in taking up the metalliferous particles in the pulp the mass thereof was yet sufficiently buoyant to float to the surface of water, the gangue sinking.

Concentration being more essential for lean ores, economy is the foundation of success, so other of these processes reduced the amount of oil to a degree where it was not sufficient of itself to float the metal, and to aid therein air, steam or gas was injected to render the mass spongy. Another process further reduced the oil and to and around 4% to 6% in weight of the weight of the metalliferous content of the ore, the somewhat novel result being that the metalliferous particles were by the oil agglomerated into granules which sank in the water and were retained in the mixing vessel, while the gangue rose and was carried off by upcast. Some dispensed with oil and employed surface tension or skin flotation by floating off the powdered metalliferous particles on the surface of quietly flowing waters, or by injecting air, steam or gas into the mixture of ore and wafer, or by generating gas therein, where bubbles attached to said particles and carried them to the surface of the water, in all the gangue sinking. Another process sought the same end by spraying the oiled metalliferous particles through air and on to water, where they remained, the gangue sinking.

In some processes acid was used to generate gas in situ for flotation, while in others it was used solely to render more pronounced the selective attribute of oil for metal over gangue. This last feature was the discovery, so far as ore concentration is concerned, of Carrie J. Everson, of Chicago, to whom a domestic patent, embodying it, issued in 1886. In some heat was used to hasten the action of the oil, and some resorted to agitation.

For anticipation, defendant relies most upon Froment's patents and working description. They date from 1902 to 1903. The process thereof is one wherein the ore is carefully crushed in two operations so as to minimize slime, and is first deslimed, for that the slime is "too fine to be treated," quoting Froment. Thereupon, to a mixture of deslimed ore and water oil and carbonate of lime (which may be limestone) are added proportionate to the weight and richness of the ore, from 1% of oil in weight of the ore, for one containing up to 5% of metal, to 3½% of oil for ore containing 50% of metal, and from about 1% of carbonate of lime in weight of the ore, 2½% in difficult cases, or more, and in like proportions to the oil for richer ore, it requiring more gas. Agitation in mixture containing two stirrers revolving in opposite directions and for a few minutes, or about 10 min. at about 300 r.p.m., the "chief point" being that all metallic particles are brought "into thorough contact with the oil," is described by Froment. The mixture is then discharged into a vat containing a perforated coil through which sulphuric acid is introduced in quantity about 10% of the carbonate of lime, and a vat therein turns slowly and about 10 to 12 r.p.m. to prevent the ore collecting at the bottom in too compact a mass.

Steam may also be injected through said coil to assist the reaction, but it is necessary in only cold countries. The reaction of the acid generates gas, which in bubbles carry the sulphides to the surface, here skimmed or pushed into a hopper. Such thereof as fall back and sink are otherwise recovered. A large proportion of the oil may be recovered from the concentrates in a press. Froment's patents refer to the use of "gas of any kind," that the bubbles will "become covered with an envelope of sulphides" and rising to the surface, "form a kind of metallic magma," and the "formation of these metallic spherules is singularly active if the gas is in a nascent state." Froment's patents, working description and an apparatus therefor, were purchased in 1903 by the patentees of the patent in suit.

It may be noted that prior to said purchase, and continuously since, said patentees were, and now are, associates and metallurgists, chemists, experimenters, inventors and operators in ore reduction in various parts of the world, with headquarters in London. To them, and in their behalf, have been issued patents, domestic and foreign, and they have purchased others. They are of complainants, and much of their work has been for complainants. There is little evidence of practical use of any of these prior processes, and no substantial evidence that any substantial commercial success has accrued to any of them, or that any of them has had any considerable continuous successful operation. Some have operated commercially with some small success, and some are long since abandoned as impracticable, experiments, failures. Froment's process has not been in practical operation.

Complainants' process has, in substance, displaced some of the prior, and has firmly established itself as a new and valuable method of ore reduction. The evidence shows many and large plants thereof, built or building, in widely separated parts of the world. Its successful operations, practically from discovery, have recovered, and largely from waste and tailings, values aggregating near $9,000,000, and at a profit of near $4,000,000, to the patent owner and its licensees. Detailed comment in respect to anticipation is little necessary, save to Froment. Looking to the evidence, and therefrom contrasting the process with complainants', Froment's requires several times the quantity of oil than does this in suit, both by examination of the patents and working description and by tests in evidence. Froment crushes the ore in two operations and deslimes it before treatment, because the slime is too fine to be treated by his process, while the process in suit needs but one crushing operation and finds slime advantageous and most easily recovered. Froment employs carbonate of lime, the process in suit does not. Froment requires acid and in greater quantity and for a different function, than does the process in suit, which latter may or may not use acid. Both may use heat, and both require agitation, Froment, agitation only to disseminate the oil, the process in suit for that purpose and also to aërate. Froment's result is by flotation by gas generated in situ, this in suit is by flotation by air introduced by vigorous agitation. Froment's product is like unto a magma, a spongy, pasty mass of oil and metallic particles, and more or less gas bubbles, while this in suit is a froth of oil and metallic particles and air bubbles. Froment's requires oil in such quantity that he deems it worthy of recovery from the concentrates, so far as it can be, this in suit so little oil, it disappears, is not sensible to sight or touch upon the concentrates, but only to analysis. In Froment's it would seem that the metallic particles are floated like the basket of balloon, while in this, like the very envelope of a balloon. Froment's is costly, while this is cheap. And from the evidence, it would seem that Froment's process would fail in practical operation, while this in suit has succeeded. In Froment's, he oils the metallic particles by agitation, then, when the mixture is quiescent, generates gas therein by quick reaction, followed by immediate and direct rising of the gas bubbles to the surface in which they may come in contact with but few metallic particles. In this in suit, vigorous agitation of the mixture beats great and excess volumes of air therein, likely bringing the ultimate air bubbles into repeated contact with many metallic particles. The action of the gas in Froment's is almost explosive in nature. He speaks of proportion of carbonate of lime to be sought as in his test-tube example, the reaction may be so sudden

and violent as to project the metallic particles out of the tube. Froment's gas bubbles, quick formed and quick rising, it may be, arrive at the surface with expansion still in progress. These or analogous reasons may account for Froment's magma breaking gas bubbles and fragile evanescent froth in so far as his result is like unto froth, and also may account for the process in suit's strong and lasting froth.

One of complainants' experts, Dr. Adolph Liebman, of London, characterizes Froment's product, as not a froth, but a magma, and his process as one involving the principles of skin flotation, assisted by bubbles of carbonic acid. He further testified that in the process in suit is produced a result which was never attained before, that the froth is of a peculiar character, "consisting of air bubbles which, in their covering film, have the minerals embodied in such manner that they form a complete surface all over the air bubbles," that though "the very light and easily destructible air bubbles are carried with a heavy mineral, yet the froth is stable and utterly different, so far as this property is concerned, from any froth known," to him, that "it appears as if the minerals were protecting the tender air bubble like an armor guarding it," that "the froth has a long life," and one is "tempted to say it is permanent, at least as far as metallurgical operation are concerned"; that he himself had "seen a froth standing for 24 hours without the least change having taken place"; that a "very striking difference between the previous processes and the process of the patent in suit, is the difference between failure and success"; that "the simplicity of the operation as compared with the prior attempts, is startling."

The differences hereinbefore set out between Froment's process and this in suit, are so obvious, numerous, radical, and, in many respects, vital, it is clear they constitute different processes. They are different in ingredients, function of some thereof, combination, manipulation, principle and result. Their points of resemblance only serve to accentuate their difference. Broadly speaking, a process is a definite combination of new or old elements, ingredients, operations, ways or means to produce a new, improved or old result. Any substantial change therein, by omission to the same or better result, or by modification or substitution with different function to the same or better result, is a new and patentable process. New or substantially changed methods whereby the product is bettered, increased, cheapened, may be a new and patentable process.

American Mining Congress Meeting

Manufacturers of mining machinery, rescue and first-aid apparatus and safety appliances are to be given an opportunity to display their wares before the mining men of the country at a great industrial exposition to be held under the auspices of and in conjunction with the American Mining Congress, in Philadelphia, Penn., the week of Oct. 20.

This exposition will be national in scope, the metal mining of the West to be as fully represented as the coal mining of the East. There is a tentative plan to have a gold-mining camp in full operation with a mill crushing the ore. Horticultural hall, the biggest place of its kind in Philadelphia, has been engaged for the occasion.

Many large coal companies that have developed the "Safety-First" movement at their mines are now negotiating for space to show the mining men and the public what they are doing for their men and will send rescue and first-aid crews. The U. S. Bureau of Mines will be represented by one of its safety cars and a picked crew of helmet men. The State of Illinois and a number of the big anthracite companies may send rescue cars for exhibition purposes.

The convention is to be the first get-together affair of all the mining interests of the country, and an attempt is to be made to show the need of a stronger national organization that will represent all phases of the industry and lead to the placing of the industry in the important place it belongs. Perhaps the leading topic of the convention will be the new system of mine taxation recently put in operation in some states and being discussed in others at the present time. The West can unite with the East upon this proposition, for Colorado and Arizona have new taxation laws for the mines and so have Pennsylvania and Michigan. Colorado mining men are claiming that they are doubly taxed and that their industry will suffer. Arizona is making similar claims and it is understood that Michigan is much dissatisfied. An increase in the price of Pennsylvania coal is threatened by reason of the new tax law in that state.

It is expected that the West will insist upon a definite Alaskan policy by Congress and there will be a demand for quick action. The smeltery-fume problem, which also mainly belongs to the West will be discussed dispassionately with the hope that an amicable adjustment may be reached. California has, at the present time, two commissions delving into this problem and Montana one.

The disposal of the débris from placer mining is another vexed question. It is claimed that the placer-mining industry of California has been nearly wiped out by drastic rules and regulations, some of them imposed by the United States Government. At the present time the débris question is in charge of a commission of United States Army engineers and it is claimed that while they zealously watch the interests of the farmers, they know nothing about the mining problem. A demand may be made for the inclusion of a mining engineer on this board to see that the interests of the mines are protected.

The coal men of the East will be principally interested in the "Safety-First" movement and the conservation of the coal lands adjacent to the great Eastern industrial centers. It is fully realized that Eastern coal fields are being rapidly used and that when they are gone, it will be useless to think of getting coal from the West.

Tin in German West Africa

A recent report from German West Africa says that the prospects of finding tin, which would pay to mine on a large scale, have not been realized. Tin occurs over a wide area between Usakos and Okombahe and elsewhere. It is found in the numerous pegmatite veins which pierce the mica schists. Unfortunately, not all the pegmatite contains tin. The nature of the occurrence is so uncertain that some of the companies interested have restricted their attention to working alluvial deposits in order to recover some of the money spent on development work. Tin will be exported in small quantities, but the prospects of a large tin industry are once more regarded as somewhat remote.

Gold Dredging in California

In the issue of Aug. 2, 1913, is an article on Natoma No. 7 dredge, crediting Paul E. Morse as the builder. As a matter of fact the Yuba Construction Co. designed and built this dredge. Mr. Morse is the construction foreman in its employ, who had charge of the work.

Petroleum and Natural Gas Have Been Discovered in the Vallala District of British New Guinea, and it is believed that the oil deposits are quite extensive. One well has found oil at a depth of 800 ft., and other wells are being sunk. The oil found is a heavy oil with asphalt base. Prospecting is going on under direction of the government.

EDITORIALS

Production of Lead

Our revised statistics of the production of lead in the United States in 1912 are given in the accompanying tables, the first of which is based on reports received by all of the refiners, classified as in previous years, i.e., the lead reported as "desilverized" and "antimonial" is the product of the refiners treating Western and foreign

PRODUCTION OF LEAD (REFINERY STATISTICS)

(In tons of 2000 lb.)

Class	1910	1911	1912
Domestic:			
Desilverized	217,490	211,041	236,207
Antimonial	9,098	8,916	9,239
S. E. Missouri	145,387	155,008	145,336
S. W. Missouri	20,729	25,993	19,224
Totals	392,704	400,958	410,006
Foreign:			
Desilverized	90,473	89,487	82,715
Antimonial	4,892	4,929	5,003
Totals	95,365	94,416	87,718
Grand totals	488,069	495,374	497,724

bullion, while the production of the Missouri and Illinois refiners is entered according to the main sources of their ore supply. Some of the Missouri lead is desilverized, but this is not enumerated separately. Many of the refiners treat lead scrap and dross. The amount of refined lead derived from such old material in 1912 was 6589 tons, against 3916 tons in 1911.

Our second table, showing the distribution of lead production according to states, is based upon the reports

PRODUCTION OF LEAD (SMELTERS' PRODUCTION)

(In tons of 2000 lb.)

State	1910	1911	1912
Arizona	1,399	4,392	3,201
California	1,038	529	1,059
Colorado	34,711	28,730	33,196
Idaho	99,840	116,524	126,035
Kansas	1,343	2,500	162,194
Missouri	160,642	173,787	
Montana	1,795	2,492	2,517
Nevada	2,119	1,076	5,640
New Mexico	1,730	1,381	2,478
Oklahoma	1,860	1,950	2,500
Utah	57,158	54,538	59,317
Wisconsin (a)	3,400	3,944	3,180
Other states	177	912	1,690
Undistributed	1,429	1,760	
Zinc smelters	1,988	3,511	6,217
Totals	370,629	398,026	409,224

of crude lead, as returned by the smelters rather than the refiners, except in the case of one interest, which is both smelter and refiner. Allowing for the refined lead obtained from scrap, dross, etc., it appears that while the refiners' production was larger than the smelters' in 1910, it was a little smaller both in 1911 and 1912. This is readily explained by the accumulation of base bullion at the Tooele works in Utah.

The smelters' reports are as near as we can come to the mine production, and we use these in recording the lead production of the United States rather than the refinery figures. The latter show how much lead was available to the market, irrespective of source, and commercially are, of course, important.

The dominant lesson of the lead statistics of recent years is the failure of lead production to increase in so large ratio as the production of copper and spelter. This is true not only of the United States, but also of the rest of the world. In other words, lead supply is all the time becoming a little shorter with respect to consumptive requirements. This no doubt is the explanation of increasing strength in the lead market.

Otherwise, the American returns for 1912 do not show anything that is very significant that was not previously known. As in 1910 and 1911, Missouri held the premier place, but its output fell off considerably in 1912. There is a possibility that the mines of the Southeastern district are now at or near their maximum. During the last 10 years they have experienced a wonderful development.

On the other hand, the Coeur d'Alene, which was supposed to have passed its zenith, with one or more of the mines of the largest producer in rather a bad way, has taken a turn upward again. During each of the last three years there has been a noteworthy increase of production.

Perhaps the most interesting feature of the statistics is the more and more lead that the zinc smelters are recovering from their residues. This comes from ore that only a few years ago was unmarketable in this country. A part of this lead is of foreign origin, but there is no way of separating it in the statistics, and consequently it is all credited to the United States.

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The A. I. M. E. at Butte

The meeting of the American Institute of Mining Engineers, which takes place next week, at Butte, Mont., is the first meeting since the reorganization of the institute, and the officers of the institute have exerted themselves to demonstrate what a technical meeting ought to be. It was an old complaint that the meetings were too often held in New York, Washington and other Eastern cities which were not mining centers; and that the Western members were by their remoteness deprived of participation. We shall not argue the question of New York being a mining center. Undoubtedly it is the greatest mining center of the world. However, we shall readily admit that whenever an A. I. M. E. meeting was scheduled for New York, the majority of the Western members coming to attend it found more of interest in the features of the metropolis than in the stately halls of the Engineering Building, and the sessions in the latter failed to command the interest that was hoped.

However, this is all changed. It used to be said that the institute ought to meet in places where there are mines and smelting works. Now, no one will deny that Butte and Great Falls are precisely such places. If there is any spot in North America where mines of the first order are concentrated that place is Butte Hill. Moreover, these are great mines, the greatest in the world, and they exemplify the best practice in mining, milling, smelting, and almost everything else. Butte is pre-

eminently the place for mining and metallurgical engineers to go to see, study and learn. It was a happy idea to nominate Butte as the first meeting place of the rejuvenated institute.

The mining men of Butte, led by the officials of the Anaconda company, have appreciated the honor being done them and have risen grandly to their self-assigned task of making this a red-letter meeting. That it is to be such a one we can see already from the papers that have been printed in the recent bulletins. These fat volumes constitute an up-to-the-minute treatise on mining and metallurgy as practiced at Butte, written by the highest authorities, viz., the men who are practicing it. In inspiring and stimulating these papers the administration of the Anaconda company deserves the highest praise. We think that no other company has ever made so great a contribution to technical literature. May the precedent be frequently followed in the future! Nothing else will be so greatly contributory to advancement in the arts.

A member of the Institute of many years, indeed one of its former presidents, writes us:

> If any justification for the change in policies of the American Institute of Mining Engineers were necessary, certainly the August Bulletin, just published, furnishes that justification. I do not recollect any previous time in the history of the Institute that we had succeeded at one time in obtaining such a collection of papers, which not only numerically, but still more by their high character and the variety of subjects presented cannot fail to impress the reader of this bulletin.
>
> We old members take great pride in our Posepny volume, and our Emmons volume, each treating on one subject only, but we here have before us the making of a monumental Montana volume which covers every phase of geology, mining, metallurgy, mechanical and electrical engineering as actually being practised in that great metallurgical center; a perfect vade mecum and guide to the metal miner of the best practice known to the profession of today.
>
> The papers are all so good that it seems almost invidious to name one more than another, but I cannot refrain from calling special attention to the splendid work and marvelous study of conditions shown in R. H. Sales' paper on the "Ore Deposits of Butte," and to the able description of the results obtained from the study of the Great Falls flue system by Messrs. Goodale and Klepinger. These two papers alone would justify our giving the title of "Montana" to our next volume of "Transactions."
>
> To the officers and members of the Institute by whose efforts such a volume has been made possible, the membership at large should certainly extend their gratitude, and I hope that the technical press throughout the country, by calling attention to this great work being done, will assist the activities and general usefulness of the American Institute of Mining Engineers and the profession at large.

We hope that the Butte meeting of the Institute will be well attended. As to the welcome that visitors will receive and the profit that they will gain we may prophesy with confidence

The Advance in Copper

Realization of the truly strong statistical position of copper, produced by an increasing consumption and a production that lately has been about stationary, has brought about a further sharp advance in the price for the metal. The prospective shortage in the supply of Lake copper, owing to the strike, has of course been contributory in creating a sentiment. Anyway, the recent decline to below 14c. undoubtedly went too far and a substantial rally was naturally due.

We have conditions now that would lead to a 20-25c. price for copper if the world were on the eve of an industrial boom. It is certain, however, that no such development is ahead of us right away. On the contrary, financial conditions the world over are still in a dangerous state and are tending to enforce contraction in business rather than to promote expansion.

For the moment, belated consumers, who overstayed the bear market of a little while ago, are having to pay a trifling premium for copper immediately required. However, there is no serious shortage of metal for that delivery, in spite of the smallness of the reported stock. A large output of cathodes is being drawn from the refineries every day. Recent events have shown in a striking way that the copper business can be run smoothly with a much smaller stock of copper than anybody thought.

New Construction

The biggest jobs of mining and metallurgical construction now under way are the United Verde, Calumet & Arizona, Clifton and Hidden Creek copper-smelting works. Important jobs that are less advanced are the zinc smeltery of the American Zinc & Chemical Co., the plant of the Southern Aluminum Co., and the mill of the Inspiration Consolidated Copper Co. In each case, the cost runs into millions. The biggest thing on hand, however, is the installation of the Chile Copper Co., which will come to about $8,000,000. Another big thing is the mill of the Alaska Gold Co. At about the same time, the Alaska-Juneau company will also be doing some big construction.

The current construction work is sufficient evidence that there is no stagnation in the mining industry. Important work is under consideration. It is in the air that Phelps, Dodge & Co. will build a big concentrating mill to treat the low-grade Copper Queen ore in the not very distant future; and it is, furthermore, in the air, that the Inspiration Consolidated will build a smelting works at Miami, Ariz.

The Anaconda Copper Mining Co. is carrying on great construction work all the time. It is now rebuilding the Washoe concentrator, and the Great Falls smelting works.

American Mining Machinery Abroad

The Bureau of Manufactures of the Department of Commerce and Labor has issued a special report on "Mining in the Federated Malay States," by D. C. Alexander, Jr., which is out of the ordinary in so far as foreign reports coming through Washington are concerned. Mr. Alexander's article would find acceptance by any technical paper, even the JOURNAL. This is explained by the facts that Mr. Alexander is both an experienced engineer and a fluent, lucid writer.

In reading his account of tin mining in Malaya, we were struck by the extent of the equipment—engines, motors, pumps, etc.—supplied by British manufacturers and the scanty representation of American manufacturers. Among the latter, the Sullivan Machinery Co. is the only one mentioned by Mr. Alexander. We wonder why American manufacturers of mining and metallurgical machinery do not emulate the policy of the U. S. Steel Corporation and attempt to expand their foreign business.

BY THE WAY

According to a press dispatch of date Aug. 4, the first automobile trip from Fairbanks, in the heart of the interior of Alaska, to the coast, was completed at midnight, when Robert Sheldon drove his five-passenger car into Valdez, having covered the 363 miles in 54 hours, actual running time. Sheldon, with two passengers, left Fairbanks at midnight, Thursday. They were forced to make a long detour because of road conditions.

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Traders in mining stocks of the Curb, who have to skirt between the Scylla of bucket-shops and the Charybdis of promoters effecting distribution, now have to look out for the new rocks of forged certificates. Consequently the lamb who purchases Goldfield Sunflower, Tonopah Midas, etc., no longer knows whether he is getting the real thing, or only a sort of green goods. Even the talent has been hooked. Anyway, we have been reading in the daily papers of some incidents connected with the shares of Tonopah North Star.

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One of our subscribers sends us some criticism of a shaft sunk on a property of which he had charge, made by a man who had charge of an adjacent property. The shaft was sunk on a hillside on a vein the strike of which was nearly parallel to the longitudinal axis of the hill. Behind the shaft the hill rose to a height about 600 or 700 ft. above the collar of the shaft. Upon viewing the shaft for the first time, the critic calmly ignored the situation of the ore, etc., and asked in a rather patronizing tone, "Why, in h——, wasn't that shaft located on top of that hill, where greater depth could have been secured?"

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In the Cloncurry district of Queensland over 1000 men are idle, says the *Australian Mining Standard,* the miners' union having refused to allow its members to continue the system of contract or piece work which has been in operation, under an agreement, for some time. As a rule, upheavals in the industrial world have as their cause the allegation that the workman is not receiving fair remuneration for his toil. Here the position is quite the reverse; it seems as if the men, or some of them, have been earning too much money. In other words, they have been too industrious, and this does not seem to suit the book as drawn up according to the ideas of the union. At Cloncurry the standard wage rate is high, miners and timbermen being paid at the rate of 12s. to 15s. per day, and artisans from 15s. to 23s. By taking contracts, however, as much as 20s. per shift can be, and has been, earned, and this the autocrats of the Trades Hall have decreed must cease.

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"Der Tunnel" is the title of a new book by the German author, Bernhard Kellerman, who has been hailed as succeeding to the laurels of Jules Verne. Kellerman's conception is of a tunnel 3100 miles long under the Atlantic Ocean, connecting America with Germany. We have read a few chapters. The Tunnel City springs up over in the thickly forested section of New Jersey near Toms River. The forest is cleared, and we glean from the book that in a day or two at the most an open cut 600 ft. deep and 12 miles long has been excavated. This hole is at the American entrance of the tunnel, which is to be started at the bottom of the abyss. The laborers, 40,000 of them, go to work when a whistle blows at 4 a.m. Over on Manhattan Isle men discard blue serge for summer suits, the cement-dust from Jersey turning those suits gray in a day. We wonder how many men Kellerman will have at work in the heading; 40,000 at the portal, how many inside? We don't recommend the book to mining engineers. Kellerman hasn't an interesting, but an ignorant imagination. His "Tunnel" reads too much like sundry "reports" that are too familiar to all of us.

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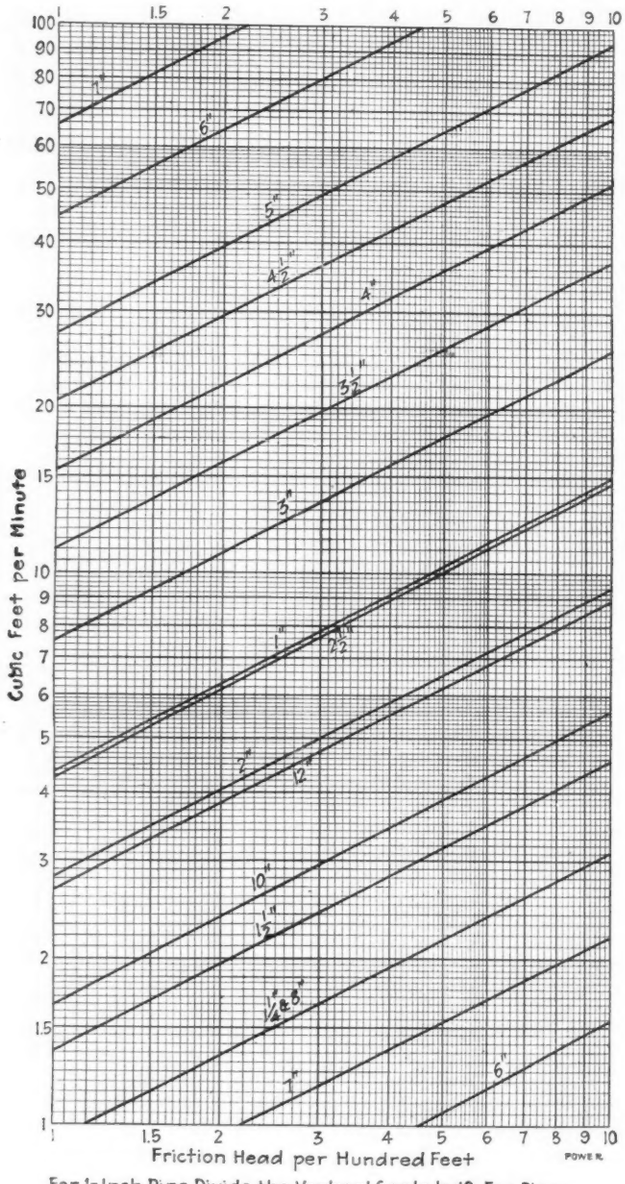
The petition of bankruptcy filed by Albert S. Bigelow in Boston recalls the fact that erroneous judgment relative to values in coppers in the Lake Superior district and in the Butte district was, to a certain degree, responsible for the financial plight in which Bigelow now finds himself. One illustration of this was brought out at the time of the Hyams effort to prevent the Calumet & Hecla from going ahead with its enlarged milling plan. During the progress of the litigation the figures at which the Bigelow interests sold out to the Calumet & Hecla at the conclusion of the litigation for control of the Osceola Consolidated were given in evidence. The Bigelows had a large percentage of Tamarack and Ahmeek stock. In the case of Ahmeek it amounted to half the total capitalization. These two issues, Tamarack and Ahmeek, were sold to Calumet & Hecla at practically the same figure, a little more than $100 a share. As events have proven, the Tamarack was not a good bargain, but the Ahmeek has more than made up for any overpay on the Tamarack or any of the others. The sale of Ahmeek at such a figure, ridiculously low as compared even with the present rock-bottom selling price, is but one instance of Mr. Bigelow's unfortunate parting with valuable securities. When he sold out control of the Boston & Montana to the Amalgamated interests it was only after he had suffered a financial beating in the stock market, which cost him almost a million, according to friends in whom he confided after the incident. His experiences in the Globe district with the refinancing of the Old Dominion are common history, pretty well known to all students of the Boston market conditions. Albert S. Bigelow's father, the late Horatio Bigelow, was largely responsible for the financing of a number of the corporations that were pioneer development propositions and afterward successful mines in this district. Associated with James Clark, he was instrumental in organizing a number of companies. When the gigantic proposition of starting the Tamarack was first suggested it was Mr. Bigelow who had the nerve to go through with it, although it involved millions and was an engineering feat which at that time was looked at askance by conservative mining men; for the Tamarack, it must be remembered, had to sink its shafts to great depth before encountering a pound of the Calumet conglomerate lode that carried commercial copper.

Flow of Water in Pipes

In problems relating to the flow of water through pipes there are five variables which must be considered, says W. L. Durand, in *Power,* July 1, 1913. These are: Quantity of water, size of pipe, velocity of flow, length of pipe, friction head. The last two may be reduced to one variable "friction head per unit length," such as "per hundred feet." A set of curves showing the relation between quantity of water, friction head and size of pipe, are presented in the accompanying chart.



For 1-Inch Pipe Divide the Vertical Scale by 10. For Pipes 6 to 12-Inches in Diameter Multiply the Vertical Scale by 100

QUANTITY OF WATER, FRICTION HEAD AND SIZE OF PIPE

Any equation of the form $y = bx^n$ may be plotted as a straight line on logarithmic paper, and *vice versa* any straight line on logarithmic paper may be reduced to the form $y = bx^n$. It is also possible to reduce a set of curves between three variables, which are straight lines on logarithmic paper, to the form $y = bx^n z^m$.

Without going into the method employed, the accompanying curves reduce to

$$V = 0.4\, d^{2.64} h^{0.53}$$

From this formula the following formulas may be derived, by the use of which any one of the four variables mentioned above may be found if any other two are known.

$$V = 0.327\, d^2 v$$

$$v = 1.22\, d^{0.64} h^{0.53} = 3.06\, \frac{V}{d^2}$$

$$h = \frac{5.6\, V^{1.89}}{d^5} = \frac{0.69\, v^{1.89}}{d^{1.21}}$$

$$d = \frac{1.42\, V^{0.38}}{h^{0.2}} = \frac{0.73\, v^{1.56}}{h^{0.83}}$$

in which,

V = Cubic feet per minute;
v = Velocity in feet per second;
h = Friction head in feet per 100 ft.;
d = Actual internal diameter of pipe in inches.

From the first formula it is also possible to make an equalization table similar to that in use for steam pipes. In using such a table the quantity of water and friction head per unit length are constants and the diameter is the only variable. If, then, in the formula

$$V = 0.4\, d^{2.64} h^{0.53}$$

V and h are taken as constants, and d as a variable, all that is necessary to make this table is to take the actual diameters and raise them to the 2.64 power. This table is as follows:

EQUALIZATION FACTORS FOR PIPES

Diameter, In.	Equalization Factor
1	1.13
1¼	2.34
1½	3.52
2	6.80
2½	10.86
3	19.3
3½	28.3
4	39.5
4½	53.3
5	71.7
6	116
7	172
8	240
10	440
12	700

By the use of this table the size of pipe equal to several smaller pipes may be determined so that the friction loss per unit length will be the same in all.

What size pipe should be used to feed four 3½-in. pipes? From the table, 28.3 is given as the equalization factor for 3½-in. pipe. Then

$$4 \times 28.3 = 113.2$$

The nearest size pipe to this factor is 6 in., which will feed four 3½-in. pipes with the same friction loss in all.

Great Britain Adopts Metric Carat

The Standards Department of the British Board of Trade has decided to adopt the metric carat of 200 mg. as the standard for all transactions in precious stones and jewelry. An official order to that effect will soon be issued. The metric carat is less by 0.00017 troy oz. than the British carat heretofore in use. The Jewelers' Association in New York has already adopted the metric carat as the standard, as noted in the JOURNAL of Nov. 16, 1912, so that it will now be generally in use among all commercial nations.

PERSONALS

J. Parke Channing arrived in New York this week.

Charles Hollister, formerly of Ray, Ariz., is now at Cananea, Sonora, Mexico.

T. W. H. Shanahan has been appointed superintendent of the San Francisco Mint.

W. B. Chidester is with the Globe Consolidated Mining Co., at Dedrick, California.

Robert H. Chapman is with the United States Geological Survey at Yerington, Nevada.

Robert B. Stewart is at Saskatoon preparing for an exploration trip in northern Alberta.

George E. Farish is in Nelson, B. C., and expects to stay in that part of British Columbia until winter sets in.

Felix MacDonald has assumed charge of the Inspiration Consolidated mine at Miami, Ariz., succeeding T. R. Drummond.

William H. Green, formerly of the Toronto University staff in mineralogy, is now at Ironwood on the Gogebic Iron Range, Michigan.

C. H. Palmer, Jr., is in Goldfield, Nev., making some examinations for Eastern interests, and expects to remain there about two weeks.

Harrison Souder, general superintendent Cornwall Ore Bank Co., Cornwall, Penn., sailed for Europe Aug. 2 and will be absent about a month.

Thomas C. Wear, formerly superintendent of the Colorado Mining Co., Arroroy, Masbate, Phillipine Islands, is now at Cananea, Sonora, Mexico.

Thomas Pearce is mine foreman for the Sterling Iron & Ry. Co. at Sterlington, N. Y. He was formerly at the Crown Reef mine in the Transvaal.

E. R. Eaton is making magnetic surveys of several extensive iron tracts in the Port Henry section of the Lake Champlain district in New York.

J. P. Hutchins has just been examining platinum mines in the Urals. According to last news from him he was on his way to the Lena River region.

C. Vey Holman, of Maine, inspected some gold-mining properties in Nova Scotia before leaving for Toronto, to attend the Geological Congress.

F. M. Simonds, of the firm of Simonds & Burns, New York, is in Cuba on professional business and will not return until some time in November.

H. Whittingham, recently associated with G. H. Garrey on mine-examination work at Sierra Mojada, Coahuila, Mexico, left New York Aug. 7 for London.

M. F. Perry, resident director of Butters Divisadero Co. and Butters Salvador Mines, Ltd., Salvador, will be in Whitney's Point, N. Y., during August and September.

James Humes, for several years connected with mining properties on Vancouver Island, B. C., is now superintendent for the Silver King Consolidated, at Park City, Utah.

C. R. Wilfley has removed to Denver, Colo., where he will have his residence and office as non-resident manager of the Barstow mine at Ouray; also, taking up consulting work.

S. H. Knox, president Marine National Bank, Buffalo, N. Y., has been elected a director of the Rogers-Brown Iron Co. to fill the vacancy caused by the death of S. M. Clement.

Dr. W. R. Crane, professor of mining in the Pennsylvania State College, has just returned from Alaska, where he has spent a year investigating the coal resources of the territory.

W. L. Saunders, chairman of the executive committee of the Ingersoll-Rand Co., has gone to Butte, Mont., to attend the meeting of the American Institute of Mining Engineers.

Frank M. Wallace, vice-president of the Pittsburgh Coal Co., and interested in several steel plants, has been appointed a member of the new Public Service Commission of Pennsylvania.

James F. Kemp was given the degree of doctor of laws by McGill University at a special convocation on Aug. 2 on the occasion of the visit of the International Geological Congress to Canada.

W. N. Crafts, president of the Crucible Steel Co., Cleveland, returned from Europe Aug. 2. Mr. Crafts has been abroad for several months, studying the operations of electric steel furnaces.

H. A. Morrison has resigned as mine superintendent with the Uwarra Mining Co. and has accepted a position under Wallace MacGregor, manager of the Globe Mine in California, beginning Aug. 10 at his new post.

Prof. Albert Sauveur, of Harvard University, Cambridge, Mass., has been awarded the Elliott Cresson gold medal by the Franklin Institute of Philadelphia, in recognition of his important contributions to the science of metallography.

John O. Pew, formerly vice-president of the Youngstown Iron & Steel Co., has been elected president to fill the vacancy caused by the death of Lucius E. Cochran. Mr. Pew remains general manager. P. W. Heedy has been elected vice-president and secretary.

David Bowen, having resigned his appointment as head of the mining department of the University of Leeds, England, has opened offices in Leeds as a consulting, mining and civil engineer. Mr. Bowen has had a long and wide experience in both coal and metal mining, in addition to geological work of a varied nature.

A dispatch from Seoul, Chosen, dated Aug. 11, says: "Mr. Mason, the American manager of the gold mine at Un-San in northern Korea, was sentenced today to 18 months' penal servitude on a charge of manslaughter for killing a Chinese mine employee, who, in the absence of Mr. and Mrs. Mason, committed a criminal assault on their 12-year old daughter. When Mason returned home and learned of the occurrence, he went out and killed the Chinaman. In his defense, Mason pleaded the 'unwritten law,' but was condemned. An appeal against the sentence was entered at once."

J. E. Johnson, Jr., has opened an office as consulting engineer and metallurgist in association with Sanderson & Porter, at 52 William St., N. Y. Mr. Johnson intends to do work for iron and steel plants and iron mines, both in engineering and advising as to operation, also investigations as to methods, quality of product, etc. The investigation upon which Mr. Johnson has been engaged for the last three years, while manager of the Ashland plant of the Lake Superior Iron & Chemical Co., covering the general subject of the quality of cast iron, was completed before he left there, and it is expected that the results will be published soon by the American Institute of Mining Engineers. Those who are familiar with these results are of the opinion that they will be of great industrial and commercial importance.

OBITUARY

Frederick H. Seymour, one of the organizers of the Detroit Copper & Brass Rolling Mills, died at Detroit, Mich., July 25, aged 63 years. He was widely known as an inventor and author and took a prominent part in public life.

Harvey D. Chess died in Pittsburgh, Aug. 10, aged 70 years. He was born in Pittsburgh, and after serving in the Civil War, became associated in business with his father, who was a manufacturer of nails, and upon the death of the latter, in 1877, he became a partner in the business with two brothers, Walter and Henry Chess. Later, this partnership became the Consolidated Expanded Metal Co., with its plant in Braddock. Mr. Chess was vice-president of that company until his retirement in 1907. He spent more than 40 years in the study of special machinery for his own lines of manufacture and so became a machine designer and engineer of national reputation.

John Milne died at Newport, Isle of Wight, England, July 31, aged 63 years. He was born in Liverpool and was educated as a mining engineer at the Royal School of Mines, London. He worked at his profession in Newfoundland and Labrador for Cyrus Field, Sir James Anderson and others. Later he was geologist to Doctor Beke's expedition into Arabia before taking up his work for Japan. He was well known all over the world, having traveled extensively in the United States, Australasia, China, Japan, the Southern Seas and Europe. For 20 years he was employed by the Japanese Government, for which he established a chain of nearly 1000 earthquake-recording stations. He also completed a seismic survey of the world for the British Association. He was the designer of seismographs and of instruments to record vibrations on railways. Among his publications are "The Miners' Handbook," "Earthquakes" and "Crystallography."

Alf. A. Tregidgo died at his home in San Francisco, Aug. 1, aged 55 years. He was one of the best known mining engineers on the Pacific Coast. He was born in Bath, England, July 13, 1858, and was a student of Oxford University. He went to Vallejo, Calif., in his earlier years and was superintendent of St. John's quicksilver mine at that place.

He married Miss Marion Russell, a graduate of Napa Seminary, by whom he had three children, Don A., Eugene de Sabla and Mabel E. Tregidgo. His mining operations extended over the whole Pacific Coast, but his most notable achievement was the damming of the Yuba River for the creation of electric power, in which he was associated with Eugene de Sabla and which was the beginning of the Pacific Gas & Electric enterprise, which has come to be one of the most powerful corporations of the West. Up to the time of his last illness, Tregidgo was superintendent of the St. John's mine at Vallejo, and was also president of El Dorado & Placer Counties Gold Mining & Power Co.'s dredging property on the Middle Fork of the American River. Besides being a man of keen intellect and sound mining judgment, he was possessed of great executive ability. He was probably the most popular president the California Miners' Association ever chose, and it can be said of him that he rarely made a failure in judgment in any mining proposition. If he did not get rich himself he had the faculty of making others rich. He was one of the most genial and companionable of men and his loss will be mourned by all of the old-time Californians.

SOCIETIES

Colorado School of Mines—The thirty-ninth year of the Colorado School of Mines opens on Sept. 2. The graduation in May of 70 students illustrates the extent to which in recent years admission to advanced standing serves to augment the numbers in the upper classes. Revision of the working schedules has simplified the courses without radically altering their scope. The requirements for admission are not changed. The prospects for the coming year indicate a decided increase in admission. Harry J. Wolf, who acted as professor of mining during much of the past year, has been appointed as permanent incumbent of that position. No changes have been made in the headships of any of the other departments. The summer school, whose session runs during July and August, has had its largest attendance this season. It serves both former students of the "Mines" and new applicants, the former for the removal of conditions, the latter to secure admission to regular standing.

INDUSTRIAL NEWS

The New Equitable Life Insurance Building, in New York, 38 stories high, will contain approximately 36,000 tons of structural steel, the inspection of which, both mill and shop, has been intrusted to Robert W. Hunt & Co.

The Braden Copper Co. has placed its fourth consecutive order, for 12 of the largest size Hardinge mills. When shipped this will make a total of 36 of these mills for its Chilean plant. The Cuba Copper Co., of Santiago, Cuba, has placed an order for four of the largest size Hardinge mills for grinding, in connection with a flotation process to be installed at its plant.

The National Tube Co. announces that commencing Aug. 1, 1913, it will enter the electrical-conduit field. It has contracted with the National Metal Molding Co. and the Safety-Armorite Conduit Co., both of Pittsburgh, Penn., to manufacture and sell this product for it as its agents, under their various brands. It has also decided to sell this product on the Pittsburgh-basing-discount plan in the same manner as all wrought pipe has been sold for the last 13 years.

Manning, Maxwell & Moore, Inc., of New York, and their subsidiary companies, will move their general offices about Oct. 1, from 85-89 Liberty St. to the new Lewisohn Building, 113-119 West 40th St. They will occupy the twentieth and twenty-first floors of the above building, which will give them 28,000 sq.ft. of space. This space will be exclusively for offices and is almost double that at present occupied for offices on Liberty St. This change is being made to meet the demand for a more convenient and central location, as well as larger space to handle material increases in their various lines, which cover electric traveling cranes, machine tools, engineering specialties, railway, machinists', engineers', factory and contractors' supplies. A large portion of this product is manufactured by their constituent companies—the Shaw Electric Crane Co., the Ashcroft Manufacturing Co., the Consolidated Safety Valve Co., the Hayden & Derby Mfg. Co. and the Hancock Inspirator Company.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

MINER'S LAMP. Carl G. Sallander, Galveston, Tex. (U. S. No. 1,068,533; July 29, 1913.)

CRUSHING MACHINE. Edgar B. Symons, Milwaukee, Wis. (U. S. No. 1,069,496; Aug. 5, 1913.)

CONCENTRATING APPARATUS. Delbert Deverell, Woodstock, Ore. (U. S. No. 1,068,633; July 29, 1913.)

ORE CRUSHER and Pulverizer. George A. Stanton, Placerville, Calif. (U. S. No. 1,068,539; July 29, 1913.)

ZINC—Process of Recovering Zinc. Charles J. Reed, Philadelphia, Penn. (U. S. No. 1,069,178; Aug. 5, 1913.)

SMELTING FURNACE (Electric). Oscar S. Emberg and Oscar J. D. Emberg, Chicago, Ill. (U. S. No. 1,069,326; Aug. 5, 1913.)

LEACHING—Treatment of Copper Liquors. John Herbert Thwaites, Peterborough, England. (U. S. No. 1,069,205; Aug. 5, 1913.)

TIN—Improvements in or Relating to the Treatment of Tin Ores. J. W. Clenhall, Totnes, Devonshire, Eng. (Brit. No. 1181 of 1913.)

ROASTING—Improvements in Funaces for Roasting Ores. Soc. Min. et Met. de Penarroya, Paris, France. (Brit. No. 3142 of 1913.)

REFINING—Process for Electrolytically Refining Copper. George D. Van Arsdale, East Orange, N. J. (U. S. No. 1,069,305; Aug. 5, 1913.)

BARYTES—Method of Separating Barytes from Ores. Charles Jason Greenstreet, Webster Groves, Mo. (U. S. No. 1,069,545; Aug. 5, 1913.)

ZINC—Process of Roasting Ores and Recovering Zinc Therefrom. Charles J. Reed, Philadelphia, Penn. (U. S. No. 1,069,179; Aug. 5, 1913.)

DRILLS—Fluid Compressor. William Prellwitz, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,069,287; Aug. 5, 1913.)

SEPARATOR—Improvements in Electromagnetic Separators. Maschinenbau-Anstalt Humboldt, Coln-Kalk, Germany. (Brit. No. 24,643 of 1912.)

MAGNETIC SEPARATOR. Lewis G. Rowand, East Orange, N. J., assignor to Wetherill Separating Co., New York, N. Y. (U. S. No. 1,068,453; July 29, 1913.)

FURNACE LININGS—Process of Forming Furnace Linings. Archer E. Wheeler and Milo W. Krejci, Great Falls, Mont. (U. S. No. 1,068,470; July 29, 1913.)

ZINC—Process of Treating Ores and Metallurgical Products. Wilhelm Troeller, Frankfort-on-the-Main, Germany. (U. S. No. 1,068,611; July 29, 1913.)

ZINC—Improvements in the Removal of Zinc from the Ore, Particularly Zinc-Lead Ore. H. C. Woltereck and J. Moeller, London. (Brit. No. 16,218 of 1912.)

ELECTRIC FURNACE and Process of Operating the Same. Ezechiel Weintraub, Lynn, Mass., assignor to General Electric Co. (U. S. No. 1,068,615; July 29, 1913.)

CONCENTRATION—Improvements in or Relating to Ore Concentration. G. A. Chapman and S. Tucker and Minerals Separation, Ltd., London, Eng. (Brit. No. 14,273 of 1912.)

ROASTING—Rabble-Arm for Roasting Furnaces. Utley Wedge, Ardmore, Penn., assignor to the Furnace Patent Co., Philadelphia, Penn. (U. S. No. 1,068,955; July 29, 1913.)

BRIQUETTING—Improved Process for Briquetting Fine Ores and More Particularly Iron Ore. Maschinenbau-Anstalt Humboldt, Coln-Kalk, Germany. (Brit. No. 14,896 of 1912.)

DRILLS—Fluid-Feeding Attachment for Hollow Drill Steels. William Prellwitz, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,069,288; Aug. 5, 1913.)

VANADIUM—Process of Extracting Values from Ores. Warren F. Bleecker, Canonsburg, Penn., assignor to the Standard Chemical Co., Pittsburgh, Penn. (U. S. No. 1,068,730; July 29, 1913.)

ZINC—Process of Treating Sulphide Ores. Court C. Titus and William J. Barenscheer, Helena, Mont., assignors to New England Electro-Chemical Metals Co., Boston, Mass. (U. S. No. 1,069,498; Aug. 5, 1913.)

SMELTER FUMES—Method of Discharge of Electricity into Gases. Frederick Gardner Cottrell, Berkeley, Calif., assignor to International Precipitation Co., Los Angeles, Calif. (U. S. No. 1,067,974; July 22, 1913.)

ROASTING—Rabble Shaft, Arms, and Plows for Roasting Furnaces. Thomas Daniells Merton, Grove Mill, Watford, England, assignor of one-half to Harry MacKenzie Ridge, London, England. (U. S. No. 1,068,518; July 29, 1913.)

CYANIDING—An Improved Process and Apparatus for the Separating of a Solution Containing Gold or Other Metals or Material from Finely Crushed Insoluble Substances. D. W. Stacey, Bulawayo, Rhodesia. (Brit. No. 23,165 of 1912.)

MELTING FURNACES—Improvements in Liquid-Fuel Furnaces for Melting Metals and Their Alloys and for Other Metallurgical Operations. A. Etienne, L. Cauet, L. Mercier and H. Mercier, Somme, France. (Brit. No. 15,252 of 1912.)

CANDLESTICK—Folding Candlestick. Harry D. Pelham and Charles P. Kaba, Colorado Springs, Colo., assignors, by mesne assignments, of one-half to Addie G. Slater, Colorado Springs, Colo., and one-half to said Charles P. Kaba. (U. S. No. 1,069,170; Aug. 5, 1913.)

ORE TREATMENT—Process for the Recovery of Gold and Silver from Antimonial, Arsenical, and other Gold-Bearing Ores. James Gitsham, Moonee Ponds, Victoria, Australia, assignor to Gitsham Gold Extraction Co., Ltd., Melbourne, Australia. (U. S. No. 1,068,646; July 29, 1913.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Aug. 7

A Railroad to Eureka in Humboldt County will be opened for traffic early in the spring of 1914. For several years this road, the Northwestern Pacific, has been operated between San Francisco and Willits and Sherwood in Mendocino County. This is about half the distance between San Francisco and Eureka. The road now extends as far north as Dos Rios and as far south from Eureka as Fort Seward, a distance of 68 miles. This leaves a gap of less than 50 miles to fill in before the road is completed, but this part of the right-of-way is mountainous and the construction work is exceptionally difficult. There will be liability to blockade on account of snowslides and rockslides in the operation of the road, but it is believed that these difficulties will be soon eliminated. It is stated by railroad men that the rate of cost of construction on this line for a distance of 39 miles between Willits and Shively has been greater than for any other railroad so far known. About 50 miles have been built in the last three years, but the construction was delayed by boring the Island Mountain tunnel, which is 4337 ft. long and reduces the length of the railroad about five miles. There are 47 tunnels. Frequently it was necessary to haul rails and supplies by wagons over rough mountain roads in the construction of tunnels. The completion of this railroad will be of great commercial advantage to the mining districts in Humboldt County. There are large deposits of copper ore in the southwest and in the central and northeasterly portions of the county. There are some gold mines, principally gravel deposits, but the development of quartz mines, like the development of the copper mines, has been retarded by the lack of railroad transportation. There are also deposits of coal still undeveloped in the southern and central portions of the county. The exploration of these coal deposits has not been sufficient to prove them of great commercial value, but the possibility of exploration and development will be increased by the completion of railroad facilities. Humboldt County was one of the first in the state to produce petroleum, and the oil is of a light gravity. Humboldt County has been known chiefly for its production of lumber, the commercial value of which has not depended upon railroad transportation.

DENVER—Aug. 9

The Option on the Golden Cycle will probably not be taken up, for the merger of the Golden Cycle Mining Co., of Cripple Creek, with the El Paso Consolidated is not likely to be effected according to John T. Milliken, president of the former company. He gave President Allen Burris, of the El Paso company, an option several months ago on fourteen-fifteenths of the stock, and Burris went to Europe to float the deal, but so far is said to have been unsuccessful, and his option expires Sept. 1, and will not be renewed, Mr. Milliken says, for while he is willing to sell outright, the mine is in splendid condition, the mill working full capacity, the production being about 6000 tons per month.

BUTTE—Aug. 7

The Three Forks to Radersburg, R.R. has been a disappointment to mining men of Broadwater County, and of Radersburg in particular, because an announcement has been made that construction work on the partially completed railroad will not be resumed this year as was intended. Construction upon the road was begun more than one year ago, but work was stopped after a few miles of grading had been done, owing to financial trouble. A short time ago, however, the promotors gave notice to those interested, that funds had been raised for resumption of the work, debts were paid, and apparently everything pointed to a speedy completion of the line.

The Pay of Miners in July was at the rate of $3.50 per day. During the month the price of copper averaged 14.37c. per lb. This rate of pay is in accordance with the agreement between the company and the Butte miners, entered into some time ago, whereby wages of underground workers are to be paid at the rate of $3.50 per day when the price of copper during the month averages less than 15c. per lb.; $3.75 with the price over 15c. and under 17c. per lb.; and $4 when over 17c. The output of the Anaconda company's smelting plants at Anaconda and Great Falls, was about 22,100,000 lb. and of the East Butte smeltery, 1,250,000 lb. of copper, making the total output of the Butte district 23,350,000 lb. The Anaconda company had on its payroll about 9000 men; the North Butte company 850, the East Butte company 450, and others, including the Butte & Superior, Tuolumne, Elm Orlu, Butte-Alex Scott, Rainbow Lode Development Co., Butte & Duluth, Butte & Zenith City, and Butte & Great Falls companies, a total of 1700, bringing the total to about 12,000 men employed during the month.

HOUGHTON—Aug. 12

The Copper Country Strike is Broken. It may be months before the Federation calls the strike off and it will be at least six months and probably one year before the mines of the Michigan copper country resume normal outputs of copper and recoup working forces to normal strength, but the situation now indicates that the strike has failed, just like every other strike which the Western Federation of Miners has incited. While none of the shafts are as yet hoisting copper rock they will be within a week. The actual working forces now employed at the mines total more than 3500, half of which are employed at the Calumet & Hecla properties. Comparatively few are working underground. The companies are doing a lot of necessary repair work on surface and about the plants. All shop and office forces are working. Pumps are going everywhere. The strike seems to have accentuated the internal dissensions among the officers of the Western Federation of Miners. Representatives of President Moyer, who are here, do not hesitate to say that they disapprove of the strike and of the actions of Vice-president Mahoney. They say the strike never would have been called if Moyer had not gone to Europe, leaving Mahoney in charge. Charges of a rather serious nature, growing out of this and other strikes, are likely to be made against some of the officials of the Federation before the national assemblage of that organization the next time it meets. The strike now has degenerated into a socialistic political propaganda. The meetings last Saturday and Sunday were socialistic. The parades comprised mostly Finn socialists of whom there are hundreds here. The paraders include all kinds of socialists, miners, servants in houses, farmers and others. The meetings have turned into socialistic harangues and the attendance has dwindled to a point where it now includes practically none but the Finn socialists who cannot understand what the English speakers say. The Federation will come to a critical and crucial point inside of another week, when the strikers will demand their strike dues. The agitators promised them $1 per day while they were on strike. They also promised that President Woodrow Wilson would come to the copper country and that the Government would take over control of the mines if they remained idle long enough and a lot of other rot that the socialistic element swallowed whole. Now there is a demand for the strike benefits and the leaders do not seem able to explain satisfactorily when the money will be paid nor where. Likewise, they claim that 90% of the men of the district have joined the union. If this is true the organization must have received a fund totaling $50,000 at a very conservative estimate of $3 per man. Nobody is quite sure what has become of that money. The mining companies are content to resume operations in a limited way and without hurry. They are taking back the good men as they want them and getting things in readiness for copper production on a limited scale. They are certainly exercising the greatest care and judgment in the men who are taken on. When the strike is over the Lake Superior mines will have the highest class of labor to be found anywhere. Not one of the agitators nor any of the men concerned in the violence or in the campaign leading up to the rioting or the strong-arm movement will get his position back again, under any circumstances. It is going to be a "white man's camp" is the talk that is heard everywhere. Thousands of Cornishmen and Scotchmen are preparing to return to the copper district. They saw what was coming months ago and they took the occasion for a journey back to the "Old Country" to avoid the trouble. They are coming back satisfied that the Western Federation never will be able to obtain a foothold again in this district. Hundreds of the better class of workmen in Butte are coming back to the Lake Superior district, disgusted with conditions in Butte and the domination of the camp by the Federation crowd of

socialists. At best, however, it is going to take a long time for this district to recover from the effects of the strike and to again show a normal copper production.

SALT LAKE CITY—Aug. 9

Gold in Bull Valley is drawing attention to a new district in Washington County, south from Modena. A sack of 94 lb. of high-grade ore was recently received here from the Bull Valley Gold Mining Co.; it brought $4500, or about $47 per lb. This material consisted of picked ore or specimens, carrying leaf gold, taken in the last few days from the company's upper tunnel. The tunnel is in 350 ft., and rich gold ore has been cut at four places, while the greater part of the work on the vein is in ore. This renews interest in Bull Valley, which first came into notice one year ago.

DULUTH—Aug. 9

The Situation at the Allouez Docks has changed, and the strikers, whom everyone thought were ready to return to work, voted to stay out. The Industrial Workers of the World have taken a hand and it is said that William H. Haywood and Joseph J. Ettor have been invited to Duluth, where they will, no doubt, stir up the usual rumpus and delay or defeat all efforts to conciliate the men. After the strikers voted to stay out, it was expected that new men would take their places, but the men who were imported as strikebreakers quit in a body when they found they were mixed up in a strike. The strikers had signified a willingness to go back to work; the dock officials had made all the concessions the strikers demanded and had agreed to give the men an increase of 15c. per day in pay, the demand for higher wages being a later issue brought up by the men, but just then a leader of the Industrial Workers of the World succeeded in stopping the move for conciliation. An inquest was held Aug. 5 over the two men who were killed in the accident that precipitated the strike. The coroner's jury decided that the men met death under the cars and cited as the cause the custom of the railroad of allowing switchmen to ride on the sides of the cars instead of the tops. On Aug. 8 the first blood of the strike was shed on the main street when Cannon, an I. W. W. leader, and one of his leading aids clashed with Oliver Mining company policemen, following a controversy regarding an open-air meeting. The aid suffered a deep scalp wound and Cannon was bruised. Sixty men, augmented by 105 during the night, loaded 15,000 tons of ore. Nine ore boats were anchored in the bay. Business men of Duluth condemned the Industrial Workers of the World and its methods in a set of resolutions. The Great Northern R.R. is fortifying itself for prolonged hostilities by beginning the construction of a large number of portable shacks in which to house strikebreakers. A sufficient number will be erected to accommodate 400 strikebreakers. A heavy guard will be maintained at the camp night and day. The Great Northern now has 100 deputies, 60 at night and 40 on day duty. They are paid $4 and board. The committee of citizens, which was refused admittance, has abandoned all efforts at intervening, having been discouraged by the unreceptive mood of the men. The committee will disband. The strikers were unable to prevent the steamer Pope, laden with ore, clearing from the dock the morning of Aug. 9; three other steamers were loaded before the end of the day and it was thought that four could be loaded the day following. Duluth vessel agents are holding their boats in the lower lakes, H. V. Brown, local agent for the Pittsburgh Steamship Co., operating 101 carriers, said: "Our company is sending a few boats to Escanaba, Two Harbors, and Ashland, but has taken all boats away from the Duluth and Superior docks. We will keep the remainder of the fleet at Lake Erie ports until the trouble blows over." The Interlake Steamship Co. operating 39 vessels, has done likewise. It is understood that each day a carrier lies idle it costs the company $600. The Great Northern road is carrying out its promise to reduce the element of risk by covering the openings under inside tracks with planks.

WALLACE—Aug. 7

A Three-Mile, Double-Track Tunnel is being planned by men interested in the Nine Mile Creek and Sunset Peak region. They have submitted to the Northern Pacific Ry. Co. a proposal that promises to solve the transportation problem in the district and assurance has been given that the matter will receive careful consideration. The plan contemplates the construction of a double-track mining tunnel 3 miles long by the railway company from the lowest practical site on West Nine Miles northeast to the different mines to be served, providing easy connection with the Rex, Tamarack and Custer Consolidated, Interstate-Callahan, Sunset, Nipsic and several others less developed and bringing many of the Sunset properties in reach by short extensions. Such a tunnel would tap the veins in W. A. Clark's Sunset at an approximate vertical depth of 3000 ft., and would open nearly every vein in the Sunset district with which it could be connected and all of them on the Nine Mile at the lowest possible level from any direction. To build a railway line into the district would cost not less than $350,000, and its operation in the winter time, because of the deep snow and steep grades, would be a constant heavy expense. A 3-mile mining tunnel, such as is proposed, would cost not more than $200,000, it is estimated, and the operation of electric trains through it would be a matter of easy accomplishment at all seasons. Individual mining companies in the Cœur d'Alenes now have in operation tunnels practically as long. The Morning mine main working tunnel is now in over 2 miles, the Hercules is driving one nearly as long from the Trade-Dollar ground and the Bunker Hill & Sullivan Kellogg tunnel is approximately 3 miles long.

FLAT RIVER—Aug. 6

A vote to Strike was polled in the southeastern lead-producing district of Missouri Aug. 6, 95% of the 4000 men employed at the mines in Flat River, Bonne Terre, Herculaneum, Leadwood, Elvins and Desloge voting to go out on strike. They demand an increase in wage of 50c. per day and recognition of the union. The executive committee of the Western Federation of Miners was to meet the night of Aug. 6 to decide when the order should become effective. The lead companies have begun preparations to close the mines. The superintendent of one mine said that the mines would be allowed to fill with water. The trouble between the operators and miners began in 1907, when wages were reduced from 20 to 25%. Several requests for a new scale have been made in the last few years, and a strike was threatened two years ago, but it did not materialize. The answer of the operators was that the price of lead had gone down and that they could better afford to shut down than to operate under the conditions demanded. Coupled with the present labor difficulty, the lead mine owners are facing a reduction in the tariff. The pioneers in the district were the St. Joseph and Doe Run Lead companies, which are controlled by virtually the same stockholders. Other companies operating in the district are the Desloge Consolidated Lead Co., the Federal Lead Co. and the St. Louis Smelting & Refining Co. The Federal Lead Co. is owned by the Guggenheims and recently erected, in Flat River, what is said to be one of the largest lead mills in the world. The St. Louis Smelting & Refining Co. is a subsidiary of the National Lead Co. Labor difficulties in St. Francois County in 1903, witnessed the closing down of mines owned by the Central Lead Co. Rather than yield to the demands of the miners, the shafts were allowed to fill with water. The company passed out of existence and the land later passed into the hands of the Federal Lead Co. when the Guggenheims decided to enter the field. The stand of the Central Lead Co. chilled the ardor of the unionists. The locals passed out of existence and were not revived until the 1907 wage cut. Residents of the district own only their home buildings, the title to all the land having been retained by the companies and the land has been leased. Approximately 20,000 are dependent on the mines.

CORDOVA, ALASKA—July 31

The Sushanna Gold Strike is causing almost as much excitement as was aroused by reports of the Klondike discovery in 1897. The recent find of rich gold-bearing gravel on the Sushanna River was made near the head of the White River, which with the Nabesna is near the headwaters of the Tanana. As a result, a stampede to the new gold field is now on in the Copper River Valley. Men from all walks of life have already joined the stampede or are preparing to join in the rush to the new diggings. From the information available, it appears that there are two creeks, Bonanza and Eldorado, upon which good pay has been struck. There are many other creeks in the district which have not yet been prospected. Some exceptionally rich strikes are reported, and while some of these may be exaggerated, those returning from the Sushanna state that prospecting has revealed wonderfully rich gravel. Although the confirmation of the strike was received from McCarthy but a few days ago, there has been a great exodus to the interior. Cables from Seattle state that more than 500 have embarked for this city. As the trail from McCarthy, along the lines of the Copper River & Northwestern Ry., is the nearest and most feasible route to the Sushanna, all of the travel to the new strike will be via Cordova. It is 50 miles from McCarthy to White River and about the same distance from White River to the diggings. Men from the States who join the stampede can come to Cordova by steamer, go to McCarthy over a broad-gage railroad and "mush" from there to Sushanna in five or six days.

THE MINING NEWS

ALABAMA

Jefferson County

STANDARD STEEL CO. (Oxmoor)—The properties of the Self Fluxing Ore & Iron Co., including 1600 acres of ore land, have been purchased by the Standard at a price said to exceed $1,000,000.

ALASKA

ALASKA GOLD MINES (Juneau)—Two 1750-kv.-a. alternating-current generators with a 50-kw. motor-generator set, a 540-kv.-a. induction motor with 22-kw. exciter, six 600-kv.-a. water-cooled transformers, switchboard panels and accessories are being supplied by the General Electric Co. for immediate installation.

McGILLIVRAY & TREML (Fairbanks)—Colin McGillivray and Joseph Treml, lessees on the Wild Rose claim of the Reliance Mining Co., have their working shaft down 50 ft., where sinking has ceased for a time on account of water. A small station has been cut, and it is planned to crosscut to the vein, which dipped into the hanging wall at a depth of 26 ft. in the shaft. If developments on the 50-ft. level prove satisfactory, the shaft will be continued to the 100-ft. level, where a larger station will be cut.

ARIZONA

Gila County

OLD DOMINION (Globe)—Ore will be raised through the Kingdon shaft while "A" shaft is being prepared for skip hoisting. Work on the concentrator is progressing rapidly.

MIAMI COPPER (Miami)—In July, underground development amounted to 5600 ft., exclusive of the work of reopening the ground in the northwest section of the orebody. That section is again in good working condition and the scale of mining will be increased in the near future. During July, 93,423 tons of ore were milled. At present the concentrator is treating about 3100 tons daily. Work of enlarging and timbering the Captain shaft down to the tramming level is proceeding rapidly. At the mill the crusher section of the building is being enlarged to make room for two sets of heavy Miami-type Traylor rolls. In the sixth unit a new type of Deister table, a quadruple-deck sand table is being installed. It is to receive a thorough test during the next few weeks. On the foundations of what would be the mill's seventh section an experimental plant is being built for leaching tests of New Keystone ores. Launders to the flat southeast of the Miami mill are being built to carry away the tailings.

INSPIRATION CONSOLIDATED (Miami)—At the millsite the first concrete was poured into the forms on Monday, Aug. 11. The concrete mixers at the millsite are set upon platforms and the sand, cement and crushed rock are carried to them already mixed by conveyor belts, the mixers merely mix the materials with water and discharge the concrete into long wooden troughs, which will convey the concrete downward to the successive walls as they are built one below the other. The concrete now being poured at the orebin foundations near the hoisting shafts in Webster Gulch is being supplied from a flat car, upon which the mixer is mounted. Launders leading out from each side of the car make it possible to fill forms on each side as the car moves along the track. The quarry west of the millsite is supplying about 80 cu.yd. of rock daily for the orebin and about an equal amount for the beginning of the mill building. As work at the latter progresses, the quarry will be opened and its output increased. Cement is arriving at the rate of one carload per day. This rate will keep the construction force supplied. It is possible that the transmission line from Roosevelt dam will be finished to Miami by November.

Mohave County

GOLCONDA (Golconda)—Timbering of the shaft is practically completed and it is expected that mining will be resumed within a few days.

TELLURIDE MINING, MILLING & DEVELOPMENT CO. (Oatman)—A 40-hp. gas engine, blower, hoist and other machinery have been installed. The main shaft is 200 ft. deep. At this depth a crosscut has cut good milling ore. It is said that near this shaft, two veins form junctions with the Tom Reed vein.

GOLD ROAD (Gold Road)—A bar of bullion valued at $17,000, the cleanest bar of bullion ever sent from this district was shipped recently. A change has been made in the personnel of the staff by Manager D. R. Muir, several of the heads of departments, including the mine and mill superintendents having left the employ of the company.

KINGMAN COPPER CO. (Mineral Park)—Upon arrival of the larger drilling rig, an attempt was made to deepen a 300-ft. hole drilled with the lighter outfit, but it was found that the hole had been filled with scrap iron for 60 or 70 ft. A new hole was started near the plugged hole, and has now reached a depth of 350 ft. Some copper ore has already been encountered.

ARIZONA VENTURE CORPORATION (Kingman)—H. R. Collins recently took charge. A small Buick runabout with a delivery body for light haulage between Kingman and the mine has been purchased, and a large shipment of supplies has been sent out to the mine. This property was at one time known as the Great Republic and produced some rich silver ore. Good copper ore has also been found in recent development work. It is understood that considerable development work is planned and that a mill may be built.

CALIFORNIA

Amador County

ZEILA (Jackson)—A large quantity of old cables and machinery long in disuse is being shipped to San Francisco. The mine and mill are in operation.

SOUTH EUREKA (Sutter Creek)—Ten stamps of the old Oneida mill have been overhauled and are now dropping on ore from the drift connecting the South Eureka and Oneida mines. All the 80 stamps of the South Eureka are also dropping on good ore.

MOORE (Jackson)—Application has been made to the Board of Equalization for a reduction of taxes from $30,000 to $8960. The mine has not been operated for several years, though it is said to be one of the best of the properties developed by Capt. W. A. Neville, now deceased. The Central Land & Trust Co., of San Francisco, made the application, which was denied.

Modoc County

SUNSHINE (Highgrade)—Jack Miller is sinking a winze from the main tunnel. It is believed that the work is being done below the main vein originally uncovered at the surface. The William Vinson lease on ground north of the main tunnel on block No. 8 was reported to have yielded satisfactory results.

LUCKY DUTCHMAN LEASE (Highgrade)—It is reported that the oreshoot has been opened up for a length of 100 ft. The ore will be sorted and a carload shipped to the Salt Lake sampling works. This lease is on the Sunshine, but that part of the mine is commonly known as the Lucky Dutchman. Fred Schrott is lessee.

MODOC MINES CO. (Highgrade)—The shaft is deeper than 200 ft.; it is equipped with a steam hoist. Difficulty with water has been experienced during the last month. The shaft will be deepened to 500 ft., and the stations will be cut and drifts driven at the 100-, 200-, 300- and 400-ft. levels. J. F. Cutler is superintendent.

Placer County

YUKON GOLD MINING CO. (Auburn)—A dredge-building camp has been established at Mammoth Bar. The lumber for the bunkhouse, cookhouse, and the stocks for launching the boat has been hauled in. Lumber and other materials were transported over the railroad operated by the Pacific Portland Cement Co. It is understood that a 7-cu.ft. bucket dredge will be built, and that a large part of its machinery will be taken from one of the boats out of commission in the Oroville field. The exploration of adjoining bars and the construction of the dredge are under the general supervision of O. B. Perry, of Oroville. The geological work is under the direction of F. R. Short, of San Francisco. Hoyt Perren is general superintendent and Mr. Munro is field superintendent. The field of exploration work includes the bars on which the Poverty Bar dredge is being built.

Sacramento County

UNION DREDGING CO. (Folsom)—It is reported that negotiations are being made by the Ashburton Mining Co. for the purchase of the Union's dredge and dredging lands in Blue Ravine. The Ashburton has a comparatively small acreage left to be dredged in its field, and the Union property has a large area.

Sierra County

PRIMROSE—This quartz property, in Hog cañon, is being thoroughly prospected by T. E. Winrod, of Downieville, who has bonded the property from A. Siebricht, owner.

SIERRA DEL ORO—An old 200-ft. tunnel is being opened and retimbered. It will be extended 300 ft. to tap the rich pay-shoot 100 ft. below the workings now open.

BANNER—This quartz property, at the head of Jim Crow cañon, has been bonded by the Harris estate to A. C. Copp, of Alameda, who will begin prospecting work at once.

KINSELBACH (Alleghany)—Development work has been resumed on this quartz property, on Kanaka Creek, by the owners, who recently came from Pasadena to take personal charge.

RED LEDGE—At this mine, on Scott's Flat, recent development work has disclosed a vein carrying free-gold ore, with sulphides assaying high in both gold and silver. A 4-stamp mill is being built and will soon be in operation.

KATE HARDY (Forest)—A raise for ventilation is being cut from the lower to the upper tunnel, with good prospects of high-grade ore being encountered in the course of the work. Ore from the upper dumps is now supplying the mill.

Yuba County

TARR MINING CO. (Marysville)—The mine at Blue Point near Smartsville, has been closed down. Large sums of money have been spent in building a plant for treating the gravel, including a dredging machine operated like a bucket-elevator dredge, but requiring no flotation pond. A report to the stockholders a few days ago stated that the superintendent, A. J. Poser, had reported that the grade of the gravel in the property was not sufficient to warrant further development or the closing of the deal with the New Blue Point Mining Co., which held the title to the ground. The contract expired June 23. At that time the final payment of $132,000 was due. A trust deed for $55,381 was also due. The failure to secure a court judgment or the amount of water required is said to have crippled the mine to some extent. It is reported also that an additional sum of $4500 remains unpaid.

COLORADO

Clear Creek County

HONEST JOHN TUNNEL (Idaho Springs)—The owners of this Chicago Creek property plan to spend $25,000 for development work. The crosscut tunnel, which is now 2100 ft. long, is to be advanced to intersect veins owned by the company. The work will be let to contractors, and for the present will be done by hand. The advisability of installing a compressor plant is being considered.

STANLEY (Idaho Springs)—During July the fifth level west heading was advanced 110 ft. to a total length of 2467 ft. The drift intersected a prominent fault, which also crosses the east drift from the third level winze. This fault has drained the water from the winze workings. A raise will soon be started from the fifth level to connect with the bottom of the winze from the third level. This connection will make the ore in this ground available through the fifth level at lower cost than heretofore, due to the elimination of the expense of pumping and hoisting from the winze.

Eagle County

THE EXTENSION OF THE LADY BELLE is claimed to have been opened by Sheriff Henry, of Eagle County, lessee of the North Dakota Claim. He has struck ore assaying from 7 to 95 oz. silver and some copper. It is 1000 ft. south of the Lady Belle and in the same formation, Dakota sandstone.

Gilpin County

NOTAWAY (Central City)—A Leyner compressor, together with the necessary auxiliary equipment, has been installed and shaft sinking will be continued with air drills. The purchasing of machine drills for drifting and stoping is being considered. The east and west headings on the new 750-ft. level are being advanced in pay ore.

WAR DANCE (Idaho Springs)—To eliminate undesirable features of the leasing system, the operators will try the system of leasing recently adopted in Cripple Creek. The company will furnish power and supplies, the lessees will furnish the labor, and the net profits from the operations will be divided equally between lessor and lessee.

San Juan Region

. ORE SHIPMENTS FROM TELLURIDE for July totalled 99 cars of concentrates, or more than three cars per day.

THE LEDGE MILL is now running steadily on custom ores. The new bins are filled and a large quantity of ore is expected in the future, from the Red Mountain district; the Silver Doctor at Animas Forks is also a large contributor.

KING (Silverton)—This mine, on Sultan Mountain, which has been idle for a few years, is once more producing. The first shipment was two cars of high-grade ore sent to the American Smelting & Refining Co. plant at Durango.

BALLARD (Telluride)—Ground is being broken in Bear Creek Gulch for a new 20-stamp mill to treat the ores from this property on Mount Ballard. The ore will be transported by a wire-rope tramway. For the last year a large vein of low-grade, free-milling gold ore has been developed.

SAN BERNARDO—This property near Ophir Loop is now being operated by lessees. The mill was recently placed in operation and it is reported that the results are gratifying. A sufficient ore reserve is blocked out in the mine to keep the mill supplied for several months and development work is opening up new ore.

JUNTA (Telluride)—Work on the new mill in Bear Creek Gulch is progressing rapidly. Five carloads of machinery were hauled to the mill last week. The company is making every effort to place the mill in operation before the beginning of winter. It is stated that ample reserves of milling ore are blocked out in the Jim Crow, Wasatch and Orion properties, in La Junta Basin, to keep the mill supplied with 300 tons per day as soon as the plant is ready to receive it.

Summit County

WELLINGTON MINES C. (Breckenridge)—A large vein has been cut in driving the crosscut on the fourth level, toward the old Oro shaft. The vein contains blende, pyrite and some lead. It seems probable that drifting in the vein will disclose a shoot of pay ore. The dry or magnetic separator mill is kept running full time on the middlings saved from the former operation of the wet mill and makes a good shipping grade of zinc concentrate.

Teller County

HOMESTAKE MILL (Cripple Creek)—Custom operations will be started by Thomas Kavanagh some time in August, when ore in 100-ton lots will be accepted. The ore will be purchased outright, a charge of $3 being made for treatment, which will be the minimum. The ore must be delivered to the mill. At present ore assaying $1 per ton is being milled. In July about 500 tons were treated. It came from the tunnel and was used only to try out the machinery. As soon as the custom ore is taken and as soon as it is determined that it can be treated there is every reason to believe that a scale of rates will be arranged.

IDAHO

Cœur d'Alene District

SONORA (Burke)—An assessment of 2 mills per share indicates that this company will resume operations. Its mine has been left idle for several years. The stock was formerly active on the Spokane market, and prospects of developing a mine were considered good. Much development work was done prior to the suspension.

ROCKFORD—Contractors have begun work on an extension of the lower tunnel of this property on Big Creek. The extension will start from the 600-ft. station and will continue 200 ft. At this point it is thought the vein will be reached and ore exposed, the 1600 ft. of tunnel along the upper workings developed ore of good grade but not in shipping quantities.

NATIONAL (Wallace)—The General Engineering Co., of Salt Lake City, has completed exhaustive tests of the National ores and has been engaged to design and erect a 500-ton plant. J. M. Callow is at the millsite with a corps of draftsmen. Construction work, under Karl Bernson, of the engineering company, will be started immediately, and the mill is expected to be under cover before snow falls.

Custer County

RED BIRD SMELTING CO. (Mackay)—A smelting plant of 100 tons capacity has been ordered from a Denver firm, and it is expected that the plant will be in operation by Oct. 1. In addition to building the reduction works the following groups of mining claims have been purchased: Red Bird, Skylark, Silver Rule, Ella and Hood. The company will be in the market for custom cres in addition to its own product.

Idaho County

MAJESTIC—(Dixie)—The milling plant of the Idaho-Champion company, about 10 miles away, has been purchased for this mine, and is now being moved. Ten stamps, vanners, leaching tanks, pumps and piping are included in the sale. The Majestic company has a power plant developed and a millsite, on which the new equipment will be placed. Sufficient ore has been developed to assure steady running of the mill.

MT. MARSHALL MINES, LTD. (Burlington)—This company, operating mines in the Marshall Lake district, was formerly known as the Rapid River Reducing Co. A tunnel has been driven for a length of 800 ft. and has cut two veins. Drifting on these veins will be started at once and the tunnel will be driven farther into the hill in the hope of cutting more veins, the existence of which is indicated by outcrops on the surface. The ore contains $36 per ton in gold and silver; $27 per ton was recovered in a recently made mill test. Development work consists of a 100-ft. shaft from which a drift 260 ft. long has been driven on one of the veins, the total length of the workings in the properties being 1734 ft. Ore is taken from several open cuts on the veins. A 6-stamp mill of 30 tons daily capacity has been built and equipped with amalgamation plates, two Wilfley tables and two Frue vanners,

MINNESOTA

Cuyuna Range

ADAMS (Oreland)—Drifting the orebody is under way. The management expects to make shipments before the close of the season.

ROGERS, BROWN ORE CO. (Crosby)—The Armour No. 1 mine has been closed down, throwing 225 men out of work. The stockpile of 35,000 tons will be shipped this season. This is an underground mine, but it is the intention of the management to change to stripping next season.

CUYUNA-SULTANA IRON CO.—An option on a manganese property on the Cuyuna range will be exercised. The acquisition of this property will make the company second in importance to the Cuyuna-Mille Lacs company as controlling valuable manganese property.

DULUTH-BRAINERD IRON CO. (Crosby)—This company will start sinking a shaft within the next 30 days. The Northern Pacific Ry. is surveying an extension from its Cuyuna-Mille Lacs mine spur to the Duluth-Brainerd property in Sec. 32, 47-29. The company has 1,500,000 tons of manganiferous iron ore shown up by drilling.

BRAINERD-CUYUNA MINING CO. (Brainerd)—At a recent stockholders meeting it was decided immediately to commence sinking a shaft on the property, inside the city limits of Brainerd. The shaft will be about 200 ft. deep, and an orebody of considerable size has been proved by drilling, although the iron content is somewhat lower than the Cuyuna range properties now shipping.

CUYUNA-MILLE LACS (Crosby)—Within the next week the manager expects to be hoisting and shipping 700 tons per day; it is expected that it will be possible to ship approximately 75,000 tons this season. This is the richest ore that is shipped out of the State of Minnesota, containing more than 20% manganese and 30% or more iron. The manganese content, however, is extremely variable.

BARROWS (Barrows)—One 3600-gal. triple-expansion pump operating at less than half capacity is raising all the water from this shaft. A station is now being cut for an additional pump of similar capacity. From 40 to 50 tons of ore per day are being hoisted, and vessel space has been reserved for at least 15,000 tons this season. The property is operated by the Virginia Ore Mining Co., a subsidiary of M. A. Hanna & Co.

PITTSBURGH STEEL ORE CO. (Riverton)—Plans are being made for building a concentrator. A considerable portion of the ore carries free quartz, which will be removed by concentrating. According to present plans, a first and second grade of concentrates will be made, the latter carrying probably 12% or more silica. A shaft is now being sunk to some of the leaner ore to obtain a sufficient supply for experimental purposes. This portion of the orebody is at a considerable distance from the hydraulic stripping operations now being carried on by this company.

Vermilion Range

NORTH AMERICAN (Tower)—It is expected that ore will be encountered at any day now. A drift is being driven on the 400 level to ore located by diamond drills.

CONSOLIDATED VERMILION & EXTENSION CO. (Tower)—The exploratory shaft on East Extension ground, which was started in ore from the surface, is still in clean hematite, running 62 to 68% iron, at a depth of 50 ft. This shaft will be known as Vermilion No. 2. The Vermilion No. 1 shaft is producing and putting ore on the stockpile.

LUCKY BOY-ANDERSON (Ely)—At this property of the Vermilion & Mesabi Iron Co. a drift is being driven at a depth of 210 ft. It is now in ore. A considerable flow of water attended entering the ore at this depth, and caused delay for a week. The orebody was 14 ft. wide at a depth of 90 ft. and 20 ft. wide at 140 ft. It is expected that the deposit will be still wider at 210 ft., and plans are being made to open up this level for production.

MISSOURI

Joplin District

PORTER LAND (Carthage)—A Carthage company has just drained the old Porter tract. Three shafts are now being reopened and within a month production will be resumed.

MacDONALD & DERISAL (Aurora)—Silicate is being produced profitably. Recent turn-ins assayed 46.80% zinc. For some time the weekly production from the mine has averaged about 4 tons.

PEACOCK-GALENA (Galena)—Five shafts have been sunk on the lease and the company is hoisting from each. Virtually the same run of ore is being worked, and the mill is in constant operation.

FORTUNE TELLER (Granby)—Three Joplin operators, F. Kincannon, Frank Sitler and John Painter, have leased this mine and also are sinking a new shaft on the property, hoping to strike a vain of zinc ore that produced well from the old shaft.

DUNCAN & CO. (Joplin)—Cuttings from three drill holes sunk on the ground of the Missouri Lead & Zinc Co. showed the presence of both lead and zinc ore at depths of 90 to 120 ft. The company intends to sink several other drill holes before sinking a shaft.

VINEGAR HILL MINING CO. (Neck City)—A 200-ton concentrator has just been purchased in Joplin for removal to a newly-developed lease at Neck City. A promising deposit has been opened on a lease of the Reliance land in the very heart of the old camp.

RUBY B. (Bellville)—Exceptionally rich ore is being taken out of a new shaft at a depth of 40 ft. Only zinc is found. Some of the dirt taken out last week assayed 40% ore. A new company is developing the tract, R. O. Spears and A. J. Hamilton, of Joplin, being interested.

WHIRLWIND MINING CO. (Carl Junction)—New steam equipment has been installed at the lease on the Budd M. Robinson land. Some good ore was developed at 60 ft., but in sinking deeper still richer dirt was found and the 94-ft. level shows exceptionally good ore.

PUSSAFISS (Joplin)—This mine has been sold to a company of Joplin and Carthage operators. Several good turn-ins have been made, although only a hand-jig outfit has been used. The new company plans to open new drifts and carry out a general campaign of development work. The mine is situated near the Seven mine, which has been in the producing column of the Joplin camp every week for several months.

EMMA GORDON (Miami)—This mine, one of the first opened up in the Miami camp, is operating again after a shutdown of several weeks, when the mill was overhauled and placed in condition for continuous operation. The land is owned by a Cherokee Indian woman. Ore was found accidentally, the strike being made while drilling for water for agricultural purposes. Since then 6 mills have been erected on the land and the Indian woman's royalty from the land has exceeded $125 per day.

SLEEPY HOLLOW MINING CO. (Joplin)—This company's tract is the latest addition to the Joplin camp. It is situated southeast of the city and consists of 80 acres. Six drill holes and three shafts have shown zince ore. Drifts have been extended from the main shaft, and from them a large quantity of ore has been taken out and placed in the bins. Both lead and zinc ore are found. Operations are being conducted from the 100-ft. and 120-ft. levels. A mill is to be built within a short time, according to Charles Wells, of Joplin, superintendent of the company, and the ore from the three shafts will be treated.

MONTANA

Butte District

ALEX-SCOTT (Butte)—Shipments are made daily of 250 tons of ore to the East Butte smeltery works and it is expected that an increase to 300 tons will be made soon. During the year recently ended the company mined 50,700 tons of ore of a gross value of $8.94 per ton. Mining and transportation charges amounted to $214,338; reduction charges to $157,555, at the rate of $3.107 per ton. The company is doing much development work and is blocking out some fine ore.

PILOT-BUTTE (Butte)—This property appears to be developing into a great mine. Three veins carrying good ore have been cut on the 2000, the lowest level opened, and two have been opened on the 1800. The first of these veins carris 9 ft. of 27% zinc ore. The second is a large copper-bearing vein which for a width of 20 ft. assays high in copper. The third vein, which has been cut on the 2200 but has not yet been reached on the 1800, is a silver- lead- and zinc-ore vein. The crosscuts are being continued to cut another known vein farther north.

TUOLUMNE (Butte)—It is stated that there is no idea at present of taking in the Colusa-Leonard in the proposed merger, on which the Tuolumne and Main Range stockholders will vote Aug. 18. The Main Range stockholders think the Tuolumne is getting the best of the proposed merger. The Tuolumne mine has for a few years been a great disappointment. On the 1800, 2000 and 2200 levels the vein is almost barren, although on the 2200 it is as strong as any vein in the district, but the ore is lean. At the crosscut, as on the 2000 and 1800 levels 20% copper ore was cut and the officers thought they had a bonanza, but the ore petered out within 20 ft. Preparations are now being made for sinking several hundred feet more.

ANACONDA (Butte)—A new steel and concrete orebin, capable of holding 5000 tons of ore, is being erected at the Belmont mine, in the southern part of the district. This orebin is 200 yd. east of the shaft, on the Butte, Anaconda & Pacific R.R. A tramway is being built from the cellar of the shaft to the bins; it is equipped for electric haulage. The Belmont shaft will be used to hosit ore from the Belmont mine, and in addition, from some of the south veins of the Anaconda mine, to which it is connected by a long crosscut. A report has been circulated for some time that practically all of the ore from the Anaconda company's mines will be hoisted through the Belmont shaft in the near future, but there is no truth in the report.

EAST BUTTE (Butte)—During the last few months a larger force of men has been working on the lower levels. It has been demonstrated that richer and more extensive bodies of ore exist on these levels than on the 800-ft. level and others above, and within the last few months more ore has been blocked out than was hoisted during the year. Work upon the enlargement of the smelting plant, which has been reported as about to be commenced many times during the last two years, is still being deferred. This is accounted for by the management as having been deemed advisable in order to liquidate the company's indebtedness as rapidly as possible. An official of the company recently stated, however, that the work will be commenced this autumn.

Broadwater County

LITTLE GIANT (Townsend)—Recently in drifting west on a vein opened by a croscut on the 600-ft. level a shoot of high-grade gold ore was encountered; the shoot is widening as progress is made. P. W. Risque, owner of a claim adjoining the Little Giant, has just shipped a carload of ore which it is believed will run about the same as a carload shipped by him a short time ago, and which netted $164 per ton.

Fergus County

KENDALL (Kendall)—If investigations now being made show its advisability, this mine and mill will be operated again. Work was suspended about one year ago.

Granite County

AMERICAN FLAG (Philipsburg)—The company operating this mine has opened the vein to a depth of 200 ft., developing good copper ore. As the long wagon haul makes the cost of transporting ore prohibitive, the company is planning the erection of a concentrator.

NEVADA

Comstock Lode

CROWN POINT (Virginia City)—The first carload of drain pipe to be utilized in carrying the water 3000 ft. from the joint incline shaft to the Sutro tunnel, is now being installed, and will be complete for use upon the installation of the pumps in the early autumn. The hot water pumped from the levels below the 1400, will be conveyed for six miles in a conduit to the mouth of the Sutro tunnel, the point of discharge.

Douglas County

A GOLD STRIKE is reported to have been made two or three miles west of Buckskin. The property is already under bond and lease, and development has been begun.

OREGON KEYSTONE MINING CO. (Dothan)—Application has been made to the state engineer for the waters of the east fork of Cow Creek for hydraulic mining. If granted, extensive development work will be done in the way of building flumes and a dam.

Lyon County

DEWITT MINE (Silver City)—A discovery of good-grade ore was recently made in this mine, and the force will be increased.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the Thompson smelting plant for the week ended July 31, 1913, were as follows: From Mason Valley mine, 1890 tons; from Nevada-Douglas, 1292 tons; from other mines, 712 tons; total, 3894, or a daily average of 556 tons. During the same week five cars of matte were shipped.

NEVADA-DOUGLAS (Ludwig)—Ore assaying 12 to 15% copper has been taken out in development on the 750-ft. level. The oreshoot here appears to be as extensive as on the level above. On the sixth level the continuation of the ore in 605 stope has been found. This is 4 ft. wide and assays 19% copper. The new oreshoot discovered between the third and fourth levels in the drift from the 417 raise assays 6% copper; 4½% ore has been discovered in the drift under the Maybe stope on Douglas Hill. On the tunnel level 6% ore has been opened from which shipments are now being made. Results of the development in the Casting Copper ground are satisfactory.

Mineral County

WAGNER AZURITE COPPER CO. (Luning)—This is commonly known as the Luning group and consists of 14 claims, situated three miles southeast of Luning. The area covered is traversed by six veins of carbonate ore in a shattered garnet-lime formation. All but one of the claims have been prospected by opencuts, and the minerals exposed are hydrous copper carbonates, red and black oxides of copper, and at a depth of 20 ft., pyrite and chalcopyrite. In the southern part of the property a shaft is now down 70 ft. This will be used for more extensive development and eventually for a main working shaft. The first car of ore, which averaged 4% copper, has been shipped. A small mill and leaching plant have been purchased. Frank Everett is manager.

Nye County

TONOPAH MINING CO. (Tonopah)—The grade of ore is now showing great improvement over that mined during the last two months, the total output for those months averaged between $14 and $15 per ton, but during July the ore milled averaged nearly $20 per ton.

NORTH STAR (Tonopah)—The east drift on the 1050-ft. level has now been extended 230 ft. in ore without a fault. The vein ranges from 4½ to 10 ft. of good shipping ore. The property is now shipping 100 tons of ore daily, but a new compressor is being installed and shipments will be increased to 150 tons.

Washoe County

BELLE ISLE—The island in the Truckee River, which is Reno's amusement park, was recently staked as a placer claim. Those staking the ground claimed there was a defect in the old title.

NORTH CARROLINA

Montgomery County

UWARRA MINING CO. (Candor)—Underground conditions led to the conclusion that the Iola company, operating adjoining property, was trespassing on Uwarra ground. Rumors of such trespassing had been current for several months, but as there was no law in the state under which a survey of the Iola workings could be ordered, Percy E. Barbour, the manager for the Uwarra company, drew up such a law modelling it upon such laws as are in force in the mining states of the West, but with the more drastic provisions of the Western laws eliminated. Despite the efforts of the Iola company early last March Barbour succeeded in getting the legislature to enact the law he had framed. The Uwarra company immediately filed a complaint and request for a survey. A date was set for a hearing and the Iola company was ordered to show cause why the order for survey should not be granted. The Iola then proposed an amicable survey. An agreement was drawn up in the form of an order of Court and was signed by the judge, but when one of the court surveyors started to make the survey he met with resistance. The Uwarra then cited the Iola for contempt whereupon the judge ordered a survey to be permitted by Uwarra engineers according to Uwarra contentions, at the same time, of course, giving the Iola the right to survey according to that company's contentions. The Iola company at this point also brought up the question of boundaries. The Iola is now under a suspended judgment in the contempt proceedings and is operating their mine under a restraining order granted to Uwarra when it first filed complaint. The framework of the Uwarra mill building is nearly all erected and placing the corrugated covering has been started. Several carloads of the mill machinery have arrived and have been unloaded. The new boilers are in place, bricked up and are ready for the stacks and piping. The new Sullivan compressor is already on its foundation. Underground, the main shaft has been sunk 53 ft. below the 300-ft. level and sinking is progressing steadily. A small hoist has been installed in the 300-ft. station, and is used for sinking and hoisting through the manway so that the cage may run without interruption to the 300-ft. level, enabling continuation of lateral development on that level. The Montgomery vein on the 150 level has been faulted and lost, for a long time, but has just been picked up. The vein in the 300 Montgomery south has just been cut off by a dike, which is the third dike in the mine. Judging from the other two it is expected that the vein will be found beyond this dike without any difficulty.

UTAH

Juab County

IRON BLOSSOM (Eureka)—The recent strike made in a fissure paralleling the main fissure about 75 ft. above the 500 has been found to extend to that level, and it is stated that preparations for stoping are being made. In July 58 cars of ore were shipped.

EAGLE & BLUE BELL (Eureka)—The recent strike of high-grade ore on the 700 appears to be of importance. The winze from the 1350-ft. level begun close to the main orebody is down 90 ft., the last 40 ft. being in ore. Stoping is being done on the 1350. During July 71 cars of ore were shipped.

YANKEE (Knightsville)—The night shift has been withdrawn from the deeper levels, although work will be continued there as heretofore. Especial attention is being given to the 200-ft. level, where prospecting was recently begun for a continuation of the Beck Tunnel ores. There are 2000 ft. of unprospected ground here on the trend of the Beck Tunnel mineral zone. Two cars of zinc ore were shipped in July.

VICTORIA (Eureka)—Drifting on the main fissure for some time in progress on the 1000- and 1200-ft. levels has resulted in the discovery of a small deposit of ore on the 1200, running well in gold, which it is thought may open into a larger oreshoot. One car of ore has been shipped from the new find. A raise from the 1200 has been completed to the 1000, improving ventilation and affording a better outlet for ore. July production amounted to 20 cars.

Salt Lake County

BINGHAM METAL (Bingham)—Drifting to the west is under way on a fissure 4 ft. wide, carrying a good grade of silver-lead ore. A raise is being lifted through mineralized ground toward the limestone above. It is stated that a contract for furnishing water is to be made with the Bingham-New Haven.

UTAH COPPER (Bingham)—A contract was recently made with the Utah Metal Co. for water from the Pine Cañon supply of the latter company, and for a new tunnel between Carr Fork and the Tooele side. A 6-in. pipeline is being laid through the tunnel to Bingham. The pipeline will be nearly four miles long, that portion of it in the tunnel measuring about two miles.

CANADA

British Columbia

THE KETTLE RIVER VALLEY RY. will be completed in about one year and will give transportation between the coast cities of British Columbia and the southern interior mining districts of the province. In present construction work 3500 men are engaged.

A NEW STRIKE OF COPPER ORE is reported from Fifteen Mile Creek, a tributary of the Coquihalla River. The find was made by Urbin Hicks, who located three claims on a showing having a width of from 8 to 14 ft. He will commence operations on the property early in September.

CORONADA (Hazelton)—R. J. McDonell, one of the principal owners of this mine on Hudson Bay Mountain, is preparing to begin development on a large scale, owing to the near approach of the Grand Trunk Pacific Ry.

BRITISH COLUMBIA COPPER CO. (Greenwood)— A six months extension of the bond on the L. H. mine, near Silverton, has been secured.

TOGO (Greenwood)—On this claim, J. D. Graham has struck a small streak of high-grade ore that assays over $400 per ton in silver and gold. The rich ore is 20 ft. from the surface in a shaft that is being sunk on the vein.

YANKEE GIRL (Ymir)—Approximately 1000 tons of ore had been shipped to the British Columbia Copper Co. plant at Greenwood before shipments were switched to Trail, on account of the percentage of lead in the ore making it unsuitable for the British Columbia company's furnaces.

BIG MISSOURI—A small crew of men is at work on this group in the Portland Canal mining division, continuing a crosscut tunnel to strike one of the veins. The owners have exposed one shoot of ore by means of open cuts. It is 110 ft. wide and assays from $10 to $12 per ton in gold, silver, copper and lead.

AUFEAS (Hope)—The vein was struck in the tunnel, July 26, at a distance of 385 ft. from the portal, and at a depth of 450 ft. The vein is 3 ft. wide where cut, and shows a higher percentage of copper than the surface. An aërial tram is to be installed and shipments to the Tacoma smelter will be started. The ore resembles that of the Nickel Plate mine in the Similkameen, except that the arsenic content is higher.

INDIAN MINE—A strike of 6 ft. of silver-lead ore has recently been made at this property on Salmon River in the Portland Canal district. A tunnel was run to get under a massive surface showing of blende and galena, and at 230 ft. in from the portal the downward extension of this orebody was met with, at a vertical depth of 150 ft. Three feet of the six is clean ore; the rest will require concentration.

Ontario

BURNSIDES (Swastika)—Arrangements are being made to form a stock company and put the stock on the market.

DANE COPPER CO. (Dane)—Work has been stopped at No. 2 shaft on account of the low grade of the ore in the bottom levels.

ERNHOUS (Swastika)—It is understood that the option on this property held by E. P. Earle and David Fasken, will not be exercised.

DOME LAKE (Porcupine)—A report states that this company is having trouble with its mill, and is not obtaining the extraction which was expected.

McINTYRE (Schumacher))—A meeting of shareholders has been called to ratify a bond issue of $250,000, of which the directors propose to sell $200,000 to pay off indebtedness and provide for development work and the enlargement of the mill.

STERLING (Elk Lake)—This property, which was recently sold at auction under a judicial order for $300,000, is again on the market, owing to the purchaser having made default in the payment of the required deposit. A resale has been ordered.

LUCKY CROSS (Swastika)—Just before the closing down of this mine while alterations are being made to the mill, a strike was made in drifting on No. 9 vein, at the 100-ft. level, where a rich oreshoot 3 ft. wide in the face of the drift was encountered. It shows a large amount of free gold, and tests have disclosed the presence of tellurium.

TOUGH-OAKES (Kirkland Lake)—These properties, also krown as the Foster-Tough, have been taken over by a company incorporated under the name of the Tough-Oakes Gold Mines, Ltd., with an authorized capital of $3,000,000 in $5 shares. The officers are: Clement A. Foster, president and managing director; Harry Oakes, vice-president, and Edwin W. Kearney, secretary-treasurer. Of the 600,000 shares, 450,000 have been issued as consideration for the properties, and of the remainder, 50,000 shares will be offered to the public at $4 per share to finance the erection of a mill.

MEXICO

San Luis Potosi

TIRO GENERAL (Charcas)—It appears quite possible that the American Smelting & Refining Co. will have to suspend operations here, due to the difficulty of doing any work under existing circumstances. Suspension of work seems most unfortunate as a large amount of construction work has just been completed, which would make this the most important, or one of the most important properties in Mexico owned by the company. The mine has been held up twice for forced loans, visited once with a little shooting between rebels and federals, and the traffic on the railroad has been cut several times since June. Of late, however, the rebels have not molested the men personally, other than to make demands for money. In February there was a fight in which 20 men were engaged, most of whom were miners who had become intoxicated. All of the women and children got out of camp safely.

Sonora

EXPORTS OF ORE FROM AGUA PRIETA for July, were as follows: Nacozari, 13,200 tons; El Tigre, 403; Churunababi, 992; Batuc, 55; Monte Cristo, 20; Rivera, 15; Agua Buena, 23; La Sonora, 38; Vaquero, 108; San Francisco, 2; Archipelago, 70; Matilde, 20; El Gallo, 298; Estrella, 32; Santa Margarita, 53; total, 15,329 tons.

HOHMAN (Nacozari)—An examination for Pittsburgh men has just been completed and the result is satisfactory. Work will be commenced immediately as the country around Nacozari is quiet and all the mines are working unmolested.

AFRICA

Transvaal

Gold production in the Transvaal in July was 655,389 oz., which is 91,688 oz. less than in June and 110,949 oz. less than in July, 1912. For the seven months ended July 31 the total output was 5,309,245 oz. in 1912, and 5,295,810 oz.—or $109,464,393—in 1913; a decrease of 13,435 oz. this year. A further

THE MARKET REPORT

METAL MARKETS

NEW YORK—Aug. 13

The metal markets have been marked chiefly by an advance in prices, which seems to be based partly on some increase in demand, but partly on a general impression as to scarcity of supplies.

MONTHLY INDEX NUMBERS

Month	1912	1913	Month	1912	1913	Month	1912	1913
Jan.	111	126	May	118	126	Sept.	127	...
Feb.	109	125	June	117	117	Oct.	133	...
March	111	125	July	114	110	Nov.	129	...
April	115	124	Aug.	120	...	Dec.	129	...

Average for year 1912, 119; year 1911, 112; year 1910, 115; year 1909, 115
Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Copper, Tin, Lead and Zinc

Copper—The market throughout the week has displayed considerable strength and a good quantity of electrolytic copper has been sold at steadily advancing prices. There has been little or no making of concessions by any of the agencies. Producers are now well booked ahead. Electrolytic copper for spot and August delivery is becoming scarce and there has been some talk of premiums in cases where buyers needed immediate supplies, but we have heard of none actually paid so far.

The business in Lake copper has been naturally very limited, as all of the mines are closed this week and the smelters have used up nearly lal the material they had on hand. A few small lots have been sold but prices of this variety must be considered entirely nominal. The strike at the Lake continues, and, although there are some of the strikers who show a disposition to give way, there is no doubt that production will not be resumed on any large scale for some time and in all probability the rest of the year will show operations on rather a reduced scale.

The Lake copper on hand continues to be held for higher prices, and at the close the market is quoted nominally at 15⅞@16c., while electrolytic copper in cakes, wirebars and ingots closes at 15.50@15.60c. Casting copper is quoted at 15@15¼c. as an average for the week.

The London market for standard copper on Aug. 7 was £68 2s. 6d. for both spot and three months. It advanced over £1 on Aug. 8 to £69 3s. 9d. for both positions. On Aug. 11 and 12 it fluctuated around £69, and on Aug. 13 was again stronger, and closes at £69 12s. 6d. for both spot and three months.

There have been considerable realizations of speculative holdings, which have been well absorbed, and leave the market in even a stronger position than before.

Base price of copper sheets was advanced 1c. on Aug. 7, and is now 21c. for hot rolled and 22c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 16¼@16½c., carload lots at mill.

Exports of copper from New York for the week were 8085 long tons. Our special correspondent gives the exports from Baltimore at 1287 tons for the week.

Visible stocks of copper in Europe July 31, are reported as follows: Great Britain, 18,037; France, 3132; Rotterdam, 4000; Hamburg, 1584; Bremen, 1699; other European ports, 1200; total, 29,652 long tons, or 66,420,480 lb.; a decrease of 1996 tons from the July 15 report. In addition to the stocks given above 2175 tons are reported afloat from Chile and 5000 tons from Australia; making a total of 36,827 tons. Stocks in other European ports have not heretofore been reported.

Brass Prices—Base prices of brass goods, dating Aug. 8, are: Sheets, high brass, 16¼c. net per lb.; low brass, 18⅛c. Wire, high brass, 16c.; low brass, 18⅛c. Rods, high brass, 16c.; low brass, 18⅞c. Tubes, brazed, 20¾c.; open seam, 20¾c. Brass angles and channels, 20¾c. Scrap allowances, 10¾c. net per lb. for high brass; 12⅜c. for low brass.

Tin—The market retained its strength mainly on the good support which it obtained from this side. There was heavy buying during last week, both by consumers and dealers, and, consequently, large orders were placed in London.

Spot material in this market seems to be concentrated in a few hands and is commanding a premium of from ⅜ to ½c. over the import price. Early this week American buyers withdrew and immediately the London market became weaker. The market closes easier at £188 for spot, and £189 for three months, and at about 41½c. for August tin here.

Lead—The market is quiet and without special feature. St. Louis is quoted at 4.37½@4.40c., and New York at 4.45@4.50 cents.

The miners' strike in the southeast Missouri lead district has not yet materialized. The miners in the Flat River district voted to strike, but so far have not carried the threat into effect.

The London market is somewhat easier, Spanish lead having declined to £20 15s. and English to £21 5s. per ton.

Spelter—The position in spelter seems to be a little stronger and there is no pressure to sell while there is a fair demand, and business has been done at somewhat higher prices. At the close St. Louis is quoted at 5.45@5.50c., and New York at 5.60@5.65 cents.

DAILY PRICES OF METALS

NEW YORK

Aug.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
7	4.8645	59⅛	15⅞ @16	15.10 @15.20	41⅜	4.45 @4.50	4.37½ @4.40	5.55 @5.60	5.40 @5.45
8	4.8665	59	15⅞ @16	15.20 @15.30	41⅛	4.45 @4.50	4.37½ @4.40	5.55 @5.60	5.40 @5.45
9	4.8650	59	15⅞ @16	15.30 @15.40	41⅜	4.45 @4.50	4.37½ @4.40	5.55 @5.60	5.40 @5.45
11	4.8655	59¼	15⅞ @16	15.40 @15.50	42⅛	4.45 @4.50	4.37½ @4.40	5.60 @5.65	5.45 @5.50
12	4.8655	59⅛	15⅞ @16	15.40 @15.50	41⅞	4.45 @4.50	4.37½ @4.40	5.60 @5.65	5.45 @5.50
13	4.8635	59⅛	15⅞ @16	15.50 @15.60	41½	4.45 @4.50	4.37½ @4.40	5.60 @5.65	5.45 @5.50

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Aug.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
7	27¼	68⅛	68⅛	73½	186¾	186½	20½	20½
8	27 5/16	69 5/16	69 5/16	74¼	187¾	187½	20¾	20⅝
9	27 5/16	....	....	....	....	....	....	....
11	27 5/16	68⅞	68 13/16	74	189¼	189¼	20⅝	20⅞
12	27 5/16	69	69	74¼	188½	187½	20¾	20¾
13	27¼	69⅛	69⅛	74	188	189	20¾	20⅝

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

At London good ordinaries close at £20 7s. 6d. and specials 5s. higher.

Base price of zinc sheets is now $7.50 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The market is rather dull, and very little business has been transacted. The uncertainty as to the tariff still holds back business and sales have been only of metal required for immediate use. Current quotations are a little lower, 22¾@23¼c. per lb. being asked for No. 1 ingots, New York delivery. Imported metal is quoted at 18½@19c. in bond. The foreign market is rather firm at last quotations.

Antimony—The market has been dull and weak, with sales only of a retail order. Cookson's is quoted at 8.35@8.40c. per lb.; Hallett's at 7.75@8c.; while 7.25@7.50c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—Business is fair and prices remain unchanged. New York quotations are $40 per flask of 75 lb. San Francisco, $39.50 for domestic orders, and $37 for copper. The London price is £7 5s. per flask, with £7 quoted from second hands.

Gold, Silver and Platinum

Gold—Gold on the open market in London was unchanged, the quotations being 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. There was no special demand.

Imports of gold at New York week ended Aug. 9, were $370,668, chiefly from Mexico; exports were $47,000, all to Cuba.

Imports of gold in France five months ended May 31, were 257,611,000 fr.; exports, 26,889,000 fr.; excess of imports, 230,722,000 fr., against 97,641,000 fr. last year.

Gold in the United States Aug. 1 is estimated by the Treasury Department as follows: In treasury current balance, $174,725,676; in banks and circulation, $606,015,613; held in treasury against gold certificates outstanding, $1,092,252,169; total, $1,872,993,458, an increase of $4,202,598 during July.

Iridium—There is no change in the position of this metal. Demand is rather quiet, but quotations remain about $85 per oz., New York.

Platinum—The situation remains unchanged both here and abroad. The Russian export tax is not yet settled, and it will probably be some time before it goes into effect. Meantime trade is inclined to be quiet, with prices unchanged. Dealers ask $45@46 per oz. for refined platinum, and $49@52 per oz. for hard metal.

Silver—The market has ruled firm and steady the past week, advancing to 27 7/16d. in London on buying by China Banks. A good deal of the strength of the market in China arises from the poor condition of the import trade. The buying for Indian Bazaars also continues good, so that prices are likely to continue steady for the present.

Exports of silver from London to the East, Jan. 1 to July 31, reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£4,240,200	£4,251,500	I. £11,300
China	933,500	462,000	D. 471,500
Total	£5,173,700	£4,713,500	D. £460,200

Imports of silver at New York, week ended Aug. 9, were $452,184, chiefly from Mexico and South America. Exports were $1,208,420, nearly all to London.

Imports of silver in France, five months ended May 31, were 135,361,000 fr.; exports, 151,706,000 fr.; excess of exports, 16,345,000 fr., against an excess of imports of 13,131,000 fr. last year.

Coined silver in the United States, Aug. 1, is estimated by the Treasury Department as follows: Standard dollars, $565,633,020; subsidiary coins, $175,582,664; total, $711,215,684. Of the dollars $483,869,000 are held in the Treasury against outstanding silver certificates.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Aug. 9

The base price paid this week for 60% zinc ore was $44@45 per ton. The base price paid for 80% lead ore was $53@55 per ton.

SHIPMENTS WEEK ENDED AUG. 9

	Zinc ore, lb	Lead ore. lb.	Sulphur ore, lb.
Week	3,208,190	331,800	877,940
Yr. to date	89,498,530	4,505,990	37,380,500

Shipped during week to separating plant, 1,876,430 lb. zinc

JOPLIN, MO.—Aug. 9

The high price of zinc blende is $48, the base per ton of 60% zinc ranging from $44 to $46.50 for choicest grades, with $48@50 base paid for blende carrying in excess of 8% iron. Calamine sold on a base of $21@23 per ton of 40% zinc. The average of all grades is $43.46 per ton. Lead sold at $54@55 per ton of 80% metal contents, with the average of all grades $53.38 per ton.

SHIPMENTS WEEK ENDED AUG. 9

	Blende	Calamine	Lead ore	Value
Totals this week	9,962,750	1,016,040	2,189,150	$285,438
Totals 32 weeks	343,720,290	25,235,420	57,212,420	9,502,519

Blende value, the week ..	$216,522	32 weeks	$7,678,538
Calamine value, the week.	10,484	32 weeks	319,700
Lead value, the week....	58,432	32 weeks	1,504,281

IRON TRADE REVIEW

NEW YORK—Aug. 13

Perhaps the most notable feature of the iron and steel trades is the more confident tone and the belief in future demand and continued activity.

New orders are increasing, though they are generally for moderate quantities. In this connection, however, it is well to consider that there is not the same inducement to contract far ahead that existed last year. The trade has been pretty well gaged, and there is no fear of any scarcity of material.

Pig iron is more in demand and is firmer. Concessions are little heard of; in fact, small advances are beginning to be the rule, especially with basic iron.

Sentiment in the steel trade continues to improve, in the direction that a buying movement cannot be far off, but there is less assurance that current prices will be maintained. The declines in sheet prices during the past few months, with declines in wire products amounting with this week's decline to $3 a ton, and the reduction of $2 a ton in steel pipe, are admitted as a suggestion that probably the majority of finished steel prices will have declined somewhat before buyers begin taking hold for forward delivery. Current buying is chiefly for quick shipment, which large mills are much better able to effect than a couple of months ago.

The International Harvester Co. has placed its contracts for steel bars for the season. They amount to about 100,000 tons and are divided between the Carnegie and the Jones & Laughlin companies.

The United States Steel Corporation reports unfilled orders on the books on July 31 at 5,399,356 tons of all kinds of material. This is a decrease of 407,961 tons from June 30; of 2,532,808 tons from Dec. 31, 1912; and of 557,723 tons from July 31 of last year.

Pig-Iron Production—The reports of the blast furnaces, as collected and published by the "Iron Age," show that on Aug. 1 there were 266 coke and anthracite stacks in blast, having a total daily capacity of 81,700 tons; a decrease of 6300 tons from July 31. Making allowance for the charcoal furnaces the estimated production of pig iron in the United States in July was 2,595,500 tons; adding the report for the first half-year, this makes a total for the seven months ended July 31 of 19,084,100 tons. Of this total 13,309,500 tons, or 70%, were made by the steel-works furnaces.

PITTSBURGH, PENN.—Aug. 12

The Steel Corporation's loss in unfilled tonnage in July, 407,961 tons, compares with a June loss of 517,005 tons and a May loss of 654,440 tons. There was a slight decrease in shipments from June to July, but even making allowance for this there is shown a material increase in books, even though they remained much below shipments. It is understood that bookings late in July were heavier than early in the month, thus promising a still better showing for August.

Additional shading of wire products by independents has caused the American Steel & Wire Co. to make another reduction in prices, and today it has notified the trade that contracts made Aug. 1 are to be reduced $1 a ton, making a general basis which it is hoped will become the turning point in prices. This basis is $1.65 for nails, $1 a ton below open prices of a fortnight ago, and $3 a ton below the market of earlier in the year.

Butt-weld sizes of steel pipe have been reduced one point, or $2 a ton. In some quarters predictions are made that bars, plates and shapes will decline about $2 a ton and it is represented that this would complete a fairly general reduction in steel prices, sufficient to inaugurate a fresh buying movement.

Pig Iron—Though the furnaces have for weeks claimed that the basic iron market was $14.25, Valley, each succeeding sale proves to have been at about $14, the latest involving a round tonnage taken by the American Steel Foundries for Alliance and Sharon delivery, at $14.50, delivered. The recently reported purchase of Jones & Laughlin Steel Co. and Youngstown Sheet & Tube Co. were at about $14, Valley furnace, though reported in the trade at the time at $14.25. We now quote basic at $14, Valley, though it might be more difficult to buy at this figure than it was when the market was openly quoted at the higher figure. Bessemer is nominally quoted at $14.50, Valley, although buyers are unwilling to take hold at the figure. Foundry iron appears definitely firmer, the $13.75 Valley quotation being probably a thing of the past. Buying on the whole is rather light. We quote: Bessemer, $14.50; basic, $14@14.25; malleable, $14.25; No. 2 foundry, $14; forge, $13.50@13.75, at Valley furnace, 90c. higher delivered Pittsburgh.

Ferromanganese—Perhaps in recognition of shading of the reduced price of $58.50 recently made, English producers have made another reduction of $2.50, and the market for both prompt and forward is now quoted at $56, Baltimore, with $2.16 freight to Pittsburgh.

Steel—Rumors are heard of possible concessions in billets and sheet bars from prices recently quoted of $26.50 for billets and $27.50 for sheet bars, at maker's mill, Pittsburgh or Youngstown. There is little demand and the strength of the market is not being tested. Rods are quotable at $28, Pittsburgh.

IRON ORE

Shipments from the Lake Superior iron-ore district in July were 8,204,416 tons, the heaviest ever reported in one month. For the season to Aug. 1 the total shipments by ports were, in long tons:

Port	1912	1913	Change
Escanaba	2,478,294	2,659,299	I. 181,005
Marquette	1,430,814	1,556,501	I. 125,687
Ashland	2,103,858	2,264,031	I. 160,173
Superior	6,668,655	7,073,413	I. 404,758
Duluth	4,385,802	5,934,664	I. 1,548,862
Two Harbors	4,223,481	4,841,552	I. 618,071
Totals	21,290,904	24,329,460	I. 3,038,556

The increase this year is coming from the eastern Mesabi; the gain from the Hill leases is comparatively small.

Imports of iron ore into Germany, six months ended June 30, were 6,843,646 metric tons; exports, 1,374,982 tons. Imports of manganese ore were 378,493 tons; exports, 4337 tons.

COKE

Connellsville coke prices continue steady at $2.50 per ton for contract furnace coke. Production and shipments were about at the usual level.

Anthracite Shipments in July were 5,487,852 long tons, a decrease of 797,301 tons as compared with July, 1912. For the seven months ended July 31 the total shipments were 32,382,132 tons in 1912, and 40,339,706 tons in 1913; an increase of 7,957,574 tons, or 24.6% this year.

Coal Passing Sault Ste. Marie canals season to Aug. 1, short tons:

	1912	1913	Changes
Anthracite	505,225	1,425,554	I. 920,329
Bituminous	5,981,229	7,986,881	I. 2,005,652
Total	6,486,454	9,412,435	I. 2,925,981

Anthracite shipments were light last year, owing to the suspension of mining in April and May.

CHEMICALS

NEW YORK—Aug. 13

The general market is still quiet with the usual midsummer dullness quite apparent.

Arsenic—Business is slow, with sales on a moderate scale. Quotations are $3.12½@3.25 per 100 lb., but are nominal in the absence of large business.

Copper Sulphate—Sales continue fair and prices are unchanged at $5.25 per 100 lb. for carload lots and $5.50 per 100 lb. for smaller parcels.

Nitrate of Soda—There is not much business doing. Quotations remain about the same, at 2.32½c. for both spot and futures up to December.

Advices from Chile report that interests representing over two-thirds of the total production have agreed to join in the new combination to restrict production.

OTHER ORE MARKETS

Manganese Ores—The schedule of prices adopted by the Carnegie Steel Co. is as follows, for deliveries in the Pittsburgh district or at South Chicago: Ore containing 49% or over metallic manganese, 25c. per unit; 46 to 49%, 24c.; 43 to 46%, 23c.; 40 to 43%, 22c. These prices are based on ores containing not more than 8% silica or 0.20% phosphorus. Deductions will be made of 15c. per ton for each 1% of silica in excess of 8%; of 2c. per unit of manganese for each 0.02% of phosphorus in excess of 0.20%. Ores containing less than 40% manganese, more than 12% silica or 0.225% phosphorus are subject to acceptance or refusal at buyer's option. These prices are for domestic ores; the greater part of the ores used are imported, and are bought abroad at current market prices.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments	472,293	1,730,252	1,771,508	2,203,191	2,705,136
Anaconda	22,900,000	23,800,000	25,600,000	21,500,000	22,100,000
Arizona, Ltd.	3,200,000	3,100,000	3,200,000	3,000,000	.....
Copper Queen	7,558,709	8,210,166	8,301,605	7,477,936	8,369,607
Calumet & Ariz.	4,250,000	4,500,000	4,300,000	4,000,000	3,800,000
Chino	4,464,723	3,925,409	3,883,611	3,682,706	4,686,250
Detroit	1,640,671	1,856,517	2,001,633	1,750,601	1,519,224
East Butte	1,400,000	1,400,000	1,268,595	1,055,646	.....
Mammoth	1,641,091	1,450,000	1,700,000	1,750,000	1,800,000
Giroux*	625,000	600,000	625,000	610,000	.....
Mason Valley	1,608,492	1,264,304	1,186,560	1,097,014	990,000
Miami	.....	.....	1,943,900	2,612,000	.....
Nevada Con.	5,555,320	5,650,000	5,933,275	6,344,863	.....
Ohio	591,651	690,001	650,071	.....	.....
Old Dominion	2,853,000	3,040,000	2,749,000	2,511,000	2,526,000
Ray	4,287,000	4,379,128	4,384,400	.....	.....
Shannon	1,260,000	1,238,000	1,080,000	924,000	880,000
Sonth, Utah	62,224	132,267	200,000	.....	.....
Tennessee	1,796,394	1,718,188	§1,037,115	1,379,220	.....
United Verde*	3,000,000	3,000,000	3,000,000	2,900,000	.....
Utah Copper Co.	8,248,880	9,539,847	10,003,227	11,637,949	.....
Lake Superior*	19,000,000	17,000,000	18,705,000	16,500,000	.....
Non-rep. mines*	6,203,606	6,000,000	6,300,000	6,000,000	.....
Total prod.	102,619,054	104,224,079	109,824,500	.....	.....
Imports, bars, etc.	24,215,480	25,578,297	22,205,942	.....	.....
Total blister.	126,834,534	129,802,376	132,039,442	.....	.....
Imp. ore & matte	11,911,041	7,177,363	10,528,562	.....	.....
Total Amer.	138,745,575	136,989,739	142,559,004	.....	.....
Miami†	3,102,200	2,312,900	.....	.....	2,890,000
Shattuck-Arizona	1,234,450	1,158,326	1,026,170	1,059,625	.....
Brit. Col. Cos:					
British Col. Cop.	844,735	794,000	.....	.....	.....
Granby	1,967,962	1,857,452	1,782,570	1,789,000	.....
Mexican Cos.:					
Boleo†	2,204,720	2,811,200	2,424,800	1,984,640	.....
Cananea	4,772,000	3,581,690	2,272,000	2,908,000	3,328,000
Moctezuma	3,062,159	2,753,240	2,695,881	3,438,793	2,693,006
Other Foreign:					
Braden, Chile	1,472,000	1,512,000	1,150,000	1,804,000	1,046,000
Cape Cop., S. Af.	732,480	586,880	387,520	414,400	.....
Kyshtim, Russia	1,478,400	2,544,640	1,490,000	.....	.....
Spassky, Russia	974,400	974,400	721,280	835,520	.....
Exports from					
Chile	7,840,000	7,616,000	3,584,000	5,824,000	9,856,000
Australia	6,944,000	6,608,000	7,840,000	7,616,000	10,304,000
Arrivals—Europe†	15,585,920	10,545,920	13,661,760	5,277,440	11,728,640

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

	United States			Visible Stocks.		
Month	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
VII, '12	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII.	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV.	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.	121,860,853	68,452,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.	138,074,602	58,904,192	78,480,071	52,904,606	71,904,000	124,808,606
VIII.	.....	.....	.....	52,904,606	66,420,480	119,325,086

Note— From Jan. 1. 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq	Sale	Amt.
Andes, Nev.	July 27	Aug. 19	$0.02
Belcher, Calif.	July 21	Aug. 14	0.10
Blue Bell, Ida.	July 15	Aug. 20	0.002
Blue Bull, Nev.	July 14	Aug. 18	0.02
Carbonate, Ida.	July 25	Aug. 25	0.001
Central Eureka, Calif.	.....	.....	0.025
Comstock, Ida.	July 24	Aug. 23	0.001
Eagle Mountain, Ida.	July 19	Aug. 16	0.0005
Eastern Star, Ida.	July 25	Aug. 25	0.002
Emerald, Utah (2d install.).	.....	Sept. 13	0.005
Galena King, Utah	July 21	Aug. 11	0.02
Independence Placer, Ida.	July 5	Aug. 29	0.002½
Iron Mask, Ida.	July 11	Aug. 11	0.002
Morning Star, Utah	Aug. 8	Sept. 1	0.0025
North Bunker Hill, Ida.	July 15	Aug. 16	0.002
O.K., Utah	July 26	Aug. 12	0.005
Overman, Calif.	July 24	Aug. 13	0.05
Rescue Eula, Nev.	July 6	Aug. 11	0.01
Saltese, Ida.	July 20	Aug. 20	0.002
Syndicate M. & E., Ida.	July 23	Aug. 23	0.003
Tar Baby, Utah.	Aug. 1	Aug. 27	0.0025
Temple, Ida.	July 19	Aug. 23	0.002
Tintic Delmar, Utah.	July 16	Aug. 16	0.001
Tuscumbia, Ida.	Aug. 1	Aug. 23	0.005
Umatilla, Nev.	July 14	Aug. 18	0.013
Utah-United, Utah.	July 19	Aug. 11	0.01
Wilbert, Utah.	Aug. 1	Aug. 23	0.02

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	.....	24.082	28.375	.....
September	52.440	63.078	.....	24.209	29.088	.....
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	.....	17.644	.....	78.670	.....
September	17.508	.....	17.698	.....	78.762	.....
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.150
March	42.577	46.832	192.619	213.645
April	43.923	49.115	200.513	224.119
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	.....	208.351	.....
September	49.135	.....	223.762	.....
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	.....	4.452	.....	19.655	.....
September	5.048	.....	4.924	.....	22.292	.....
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	.....	6.878	.....	26.443	.....
September	7.454	.....	7.313	.....	27.048	.....
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	.....	14.90	.....	14.85	.....
September	16.86	.....	16.03	.....	15.63	.....
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Aug. 12

Name of Comp.	Bid.
Acacia	.02½
Cripple Cr'k Con.	.01¼
C. K. & N.	.10
Doctor Jack Pot.	.05½
Elkton Con.	.56½
El Paso	2.00
Findlay	.02½
Gold Dollar	.05½
Gold Sovereign	.02½
Isabella	.11⅞
Jack Pot	.04½
Jennie Sample	.05
Lexington	.02
Moon Anchor	.01
Old Gold	.01½
Mary McKinney	.56
Pharmacist	.01
Portland	.95
Vindicator	.83
Work	‡.005

SALT LAKE Aug. 12

Name of Comp.	Bid.
Beck Tunnel	.05
Black Jack	.06
Cedar Talisman	.01
Colorado Mining	.14
Columbus Con.	‡.07
Crown Point	‡.01½
Daly-Judge	6.35
Grand Central	.50
Iron Blossom	1.25
Little Bell	‡.10
Lower Mammoth	.01¼
Mason Valley	$6.00
May Day	.05½
Nevada Hills	.81
New York	‡.02
Prince Con	.28
Silver King Coal'n	3.20
Sioux Con.	.02
Uncle Sam	.02
Yankee	‡.08

TORONTO Aug. 11

Name of Comp.	Bid	Name of Comp.	Bid
Bailey	.07	Foley O'Brien	.20
Coniagas	7.05	Hollinger	15.25
T. & Hudson Bay	$65.00	Imperial	‡.01
Timiskaming	.28	Jupiter	.24
Wettlaufer-Lor.	.11	Pearl Lake	.32
Apex	‡.005	Porcu. Gold.	.08
Crown Chartered	‡.00¾	Preston E. D.	.02
Dobie	.25	Rea	.15
Dome	14.00	Swastika	.03
Dome Exten.	.06	West Dome	.10

SAN FRANCISCO Aug. 12

Name of Comp.	Bid	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.04	Belmont	6.65
Belcher	.24	Jim Butler	.66
Best & Belcher	.06	MacNamara	.12
Caledonia	1.10	Midway	.47
Challenge Con.	.06	Mont.-Tonopah	1.02½
Chollar	.01	North Star	.86
Confidence	.15	West End Con.	1.17½
Con. Virginia	.09	Atlanta	.14
Crown Point	.20	Booth	.01
Gould & Curry	.03	C.O.D. Con.	.03
Hale & Norcross	.08	Comb. Frac.	.03
Mexican	1.00	Jumbo Extension	.11
Occidental	.70	Pitts.-Silver Peak	.46
Ophir	.18	Round Mountain	.51
Overman	‡.50	Silver Pick	.02
Potosi	.01	Tramp Con.	‡.01
Savage	.11	Argonaut	2.00
Sierra Nevada	.05	Bunker Hill	1.50
Union Con.	.09	Central Eureka	.10
Yellow Jacket	.17	So. Eureka	2.62

N. Y. EXCH. Aug. 12

Name of Comp.	Clg.
Amalgamated	74¾
Am. Agri. Chem.	46½
Am.Sm.&Ref.,com	67¼
Am. Sm. & Ref., pf.	102
Am. Sm. Sec., pf. B	81¾
Anaconda	37⅝
Batopilas Min.	1¼
BethlehemSteelpf	74
Chino	40⅜
Federal M. & S., pf.	39
GreatNor.,ore.,ctf.	36¼
Guggen. Exp.	46
Homestake	103
Inspiration Con.	15¾
Miami Copper	22¾
Nat'nalLead,com.	49¼
National Lead, pf.	105½
Nev. Consol.	16¼
Phelps Dodge	192½
Pittsburg Coal, pf.	84⅞
Quicksilver, pf.	3⅝
Ray Con.	19⅛
Republic I&S,com.	25½
Republic I & S, pf.	89
SlossSheffi'd,com.	29
Sloss Sheffield, pf.	85
Tennessee Copper	31⅞
Utah Copper	50⅞
U. S. Steel, com.	65¼
U. S. Steel, pf.	108⅝
Va.Car. Chem., pf.	96

N. Y. CURB Aug. 12

Name of Comp.	Clg.
Barnes King	1.73
Beaver Con.	.30
Big Four	.38
Braden Copper	6⅞
B. C. Copper	2⅜
Buffalo Mines	2⅜
Can. G. & S.	.24
Con. Ariz. Sm.	¼
Davis-Daly	2⅛
Diam'field-Daisy	.02
Ely Con.	.08
Florence	.27
Giroux	1⅝
Gold Hill Con.	1/16
Goldfield Con.	1⅝
Greene Cananea	34
Greenwater	.05
Internat. S. & R.	‡109
Kerr Lake	3/16
Keystone	‡2
La Rose	2¼
McKinley-Dar-Sa.	1¾
Min. Co. of A. new	2½
Motherlode Gold.	‡.60
Nipissing Mines	9
Ohio Copper	⅛
Pacific Sm. & M.	⅛
Puebla S. & R.	2 3/16
South Live Oak	‡2 5/32
South Utah M. & S.	1/16
Stand'd Oil of N.J.	372
Stewart	1/16
Tonopah	4 5/16
Tonopah Ex.	2 2/16
Tonopah Merger	.71
Tri-Bullion	⅛
Tularosa	⅜
Union Mines	⅛
United Cop., pfd.	2½
Yukon Gold	2½

LONDON Aug. 2

Name of Com.	Clg.
Camp Bird	£0 15s 0d
El Oro	0 14 3
Esperanza	1 1 3
Mexico Mines	5 5 0
Oroville	0 5 6
Santa Gert'dis	0 16 3
Stratton's	0 1 9
Tomboy	1 6 3

BOSTON EXCH. Aug. 12

Name of Comp.	Clg.
Adventure	1¼
Ahmeek	275
Alaska Gold M.	19¼
Algomah	1⅛
Allouez	36
Am. Zinc	21½
Ariz. Com., ctfs.	3 1/16
Bonanza	.32
Boston & Corbin	1
Butte & Balak	1½
Calumet & Ariz.	64½
Calumet & Hecla	420
Centennial	13
Cliff	1½
Copper Range	40⅜
Daly West	2¼
East Butte	12⅜
Franklin	4⅝
Granby	62¼
Hancock	17½
Hedley Gold	‡30
Helvetia	.35
Indiana	5½
Island Cr'k, com.	52
Island Cr'k, pfd.	83
Isle Royale	18¾
Keweenaw	1
Lake	8
La Salle	3¼
Mass	3
Michigan	¾
Mohawk	43⅜
New Arcadian	1¾
New Idria Quick.	‡3¾
North Butte	28½
North Lake	1⅛
Ojibway	¾
Old Dominion	49½
Osceola	80½
Quincy	69½
Shannon	7
Shattuck-Ariz.	25
Superior	25¼
Superior & Bost.	2½
Tamarack	29
Trinity	4¼
Tuolumne	1
U. S. Smelting	37¾
U. S. Smelt'g, pf.	48
Utah Apex	1¾
Utah Con.	9¼
Victoria	1½
Winona	1⅛
Wolverine	45
Wyandot	¾

BOSTON CURB Aug. 12

Name of Comp.	Bid
Bingham Mines	4
Boston Ely	.54
Butte & Lon'nDev.	.27
Butte Central	.06
Cactus	.02
Calaveras	2½
Chief Cons	1⅞
Corbin	.97
Cortez	.20
Crown Reserve	1½
Eagle & Blue Bell	.95
First Nat. Cop.	2½
Houghton Copper	3⅞
Majestic	.35
Mexican Metals	.53
Moneta Porc.	‡.07
Nevada-Douglas	1⅞
New Baltic	.70
Oneco	.80
Raven Copper	.15
Rhode Island Coal	.01
Smokey Dev.	1
S. W. Miami	‡1½
South Lake	4½
Trethewey	⅜
United Verde Ext.	.61

‡Last quotation.